

TECHNOLOGY REVIEW

May 1953



technology review

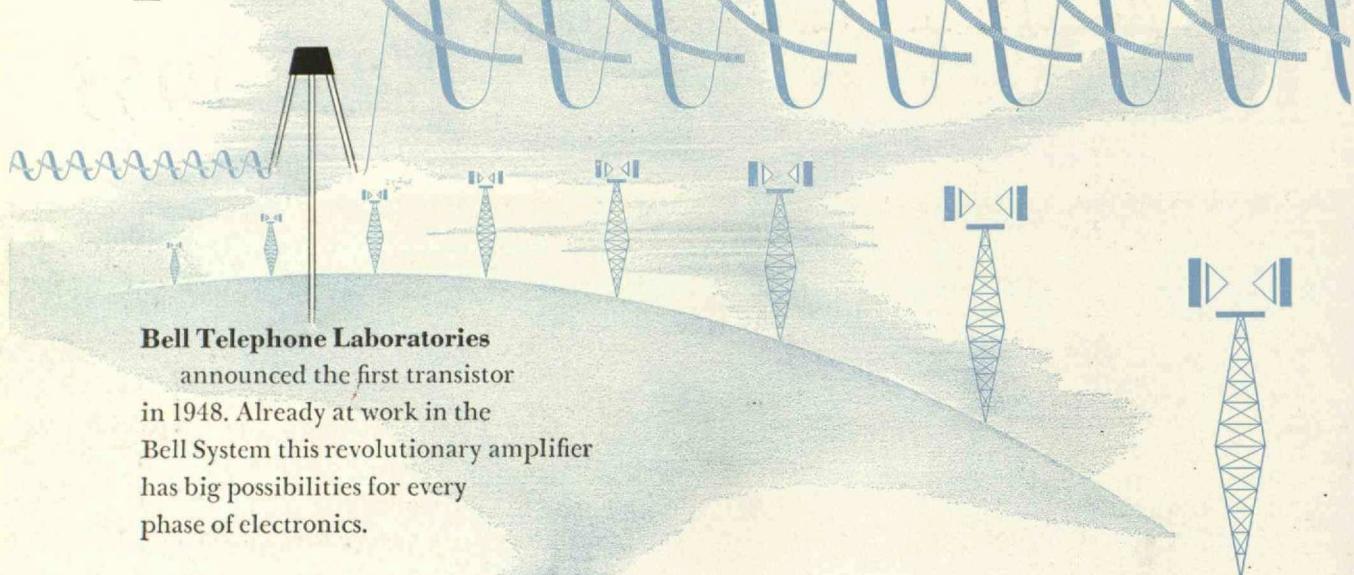
Published by MIT

This PDF is for your personal, non-commercial use only.

Distribution and use of this material are governed by copyright law.

For non-personal use, or to order multiple copies please email
permissions@technologyreview.com.

Pioneers in precision



Bell Telephone Laboratories

announced the first transistor in 1948. Already at work in the Bell System this revolutionary amplifier has big possibilities for every phase of electronics.

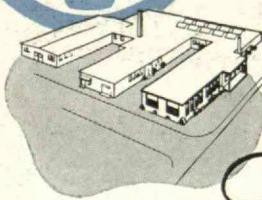
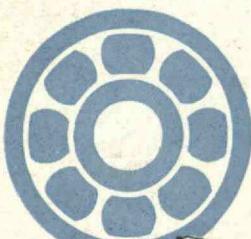
Miniature Precision Bearings

of the radial bearing type, were originated by **MPB** many years ago. From an original group of five bearings, **MPB** has designed and developed a completely integrated line of more than 130 types and sizes. This variety of **MPB** ball bearings provides a ready solution to some of the most difficult miniaturization projects. Over three thousand discriminating customers are currently being supplied with **MPB** components for specific applications.

MPB ball bearings are fully ground, lapped, and/or honed to ABEC 5 tolerances or better. They are torque tested, ultrasonically cleaned, supplied in specific tolerances and classified within the tolerances for prompt assembly and maximum performance. **MPB** ball bearings are normally supplied in 10 design series, from 1/10" to 5/16" o.d., of high carbon chrome bearing steel. Most are also supplied in stainless steel and some in beryllium copper. All are assembled with highest quality balls.

The wealth of engineering knowledge amassed through participation in the application of more than a million miniature ball bearings is available to you. Your request for our new catalog TR5 will receive prompt attention.

We'd like to include you in our future production plans. Recent expansion in production facilities has enabled us to broaden our ability to serve you promptly.



Miniature *precision* Bearings

Incorporated



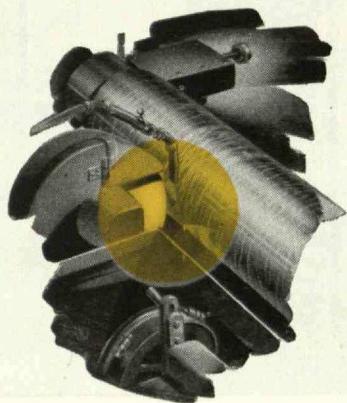
Keene, New Hampshire

"Pioneer Precisionists to the World's foremost Instrument Manufacturers"

{ save
space
weight
friction

DO YOUR ABRASIVES GIVE YOU THE

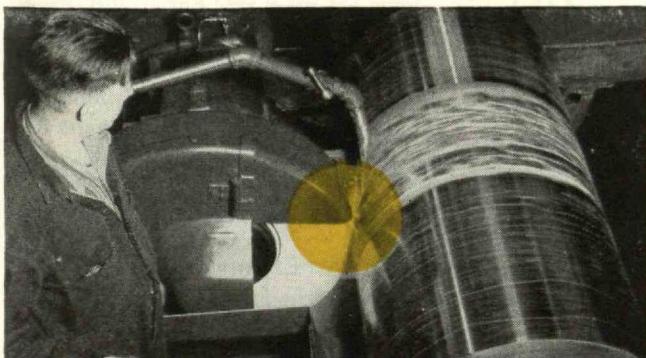
"TOUCH OF GOLD"?



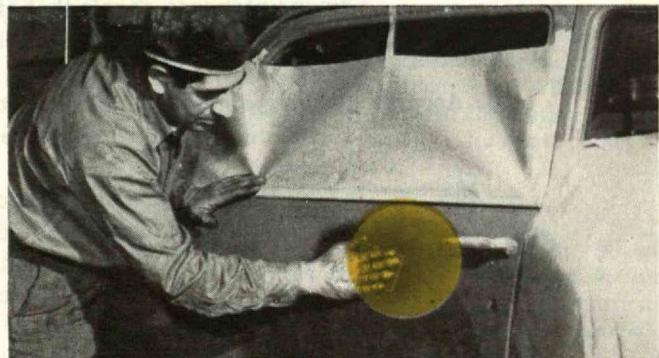
Something important happens to a product ground or finished by men who have the "Touch of Gold." What starts as unfinished material gains value and usefulness every time the right abrasive touches it. Norton and Behr-Manning Abrasives have the superiority only years of experience, resources and leadership can give. They assure your men the "Touch of Gold" for every grinding job in your shop.

Norton Company, Worcester 6, Mass.

*Behr-Manning Corporation, Division of Norton, Troy, N. Y.
Plants, distributors and dealers the world over.*



A "Touch of Gold." A Norton Grinding Wheel newly developed to do better, faster work on massive "cold mill" rolls like this ... gives your operator the "Touch of Gold."



A "Touch of Gold." Behr-Manning's "TUFBAK" SPEED-WET paper preparing automobile door panel for painting. TUFBAK does better, faster sanding ... gives workers the "Touch of Gold."

Making better products to make other products better

NORTON

NORTON



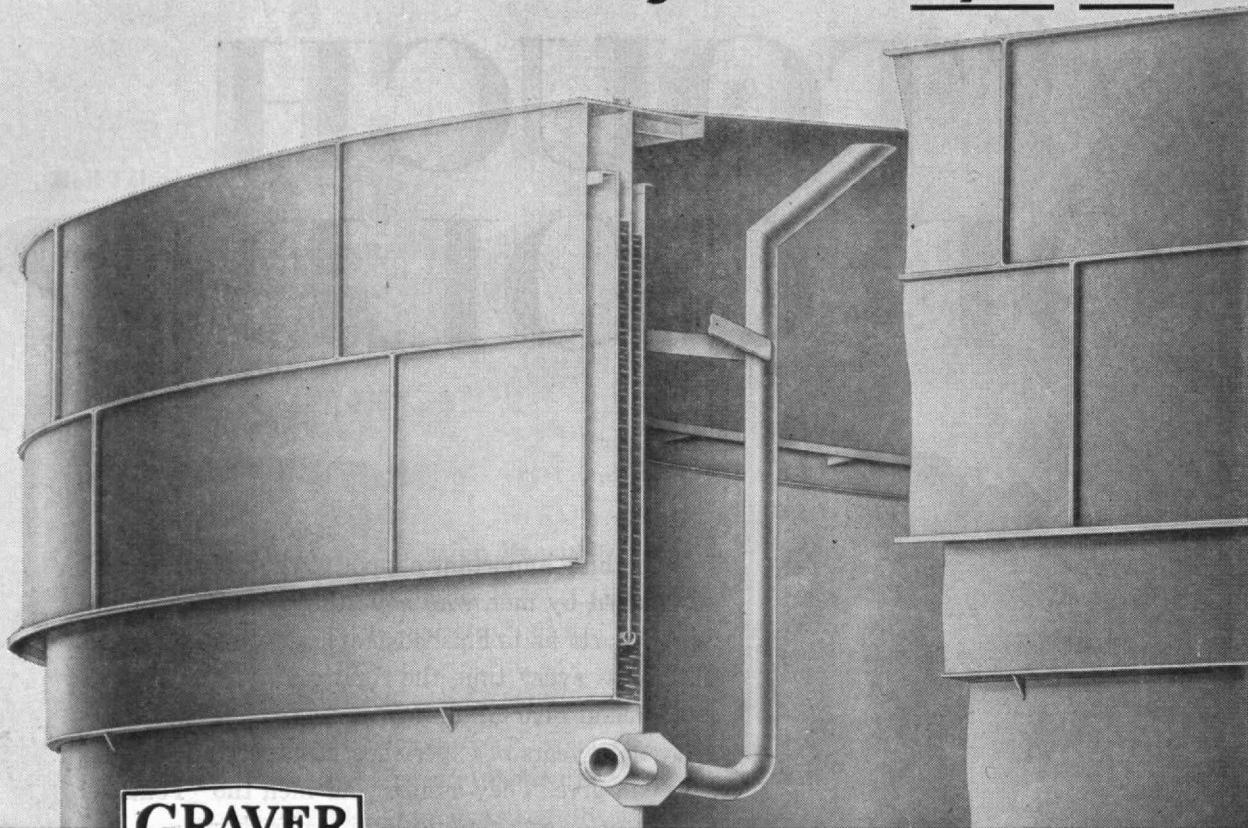
BEHR-MANNING

ONLY THE

GRAVER

**EXPANSION
ROOF**

...offers all the advantages of the liquid seal



GRAVER

Positive seal protects under all conditions

High operational efficiency shown over a decade

...Low maintenance equals that of cone roof tankage

Easy manifolding affords terminal-wide protection

...Accurate gauging obtained through vertical lift

Unique stabilizing device means trouble-free action

...Removable weather hood facilitates inspection

Simple installation converts existing tankage

Underwriters' Laboratories asserts Graver Expansion Roof
conducive to reduction of fire hazards



Available upon request is a 16-page booklet describing in full the operation of this exclusive Graver design. Graver Expansion Roof tanks have been protecting volatile elements of gasoline at important installations since 1939.

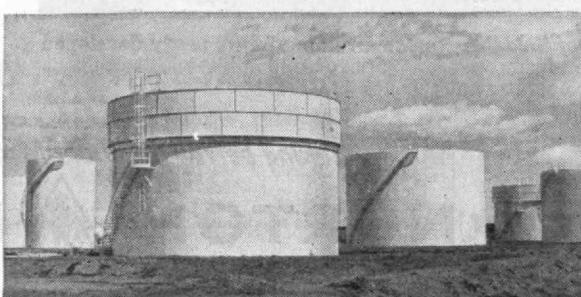
GRAVER TANK & MFG. CO., INC.

EAST CHICAGO, INDIANA

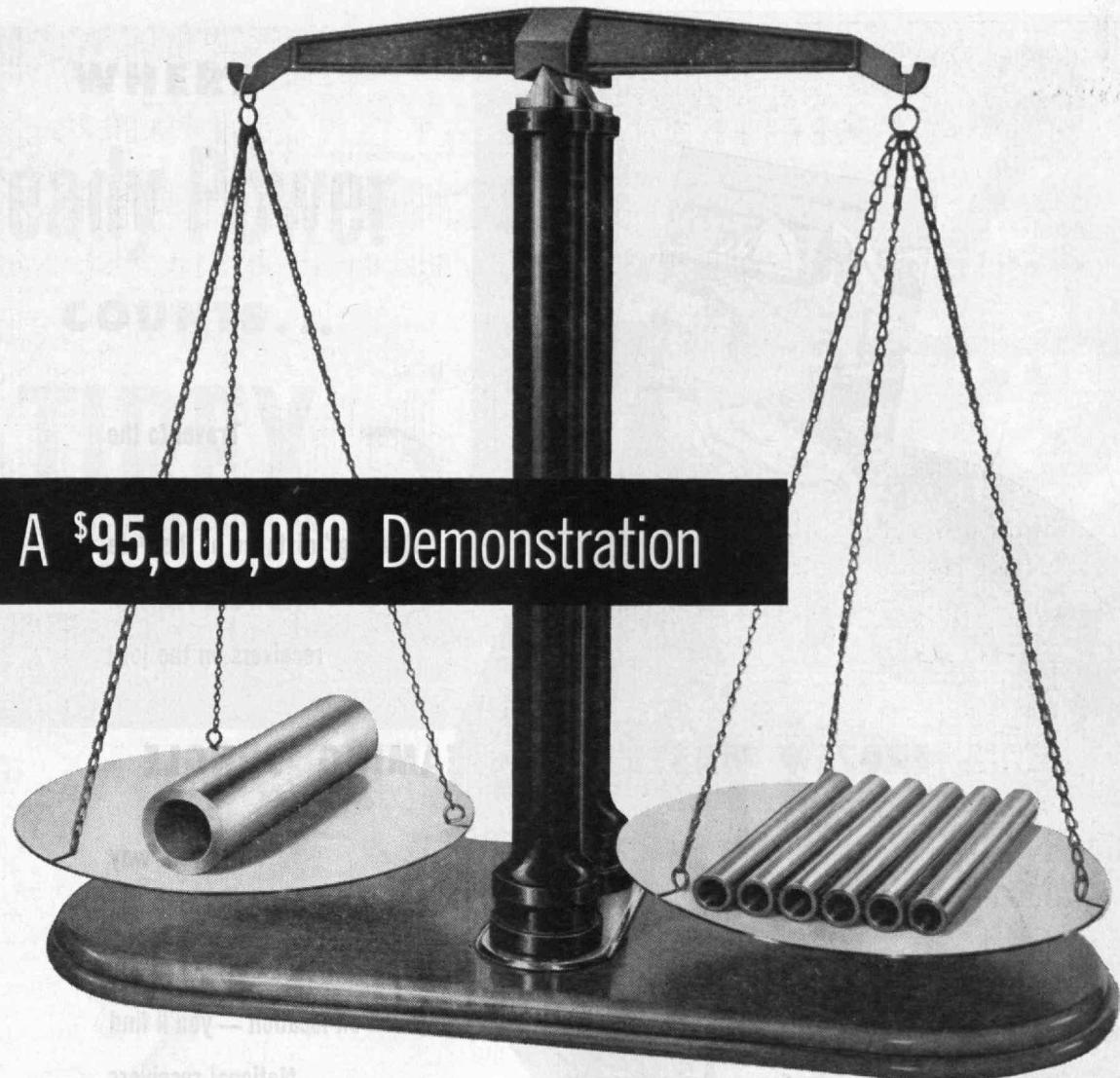
NEW YORK • CHICAGO • PHILADELPHIA • ATLANTA

DETROIT • CLEVELAND • HOUSTON • PITTSBURGH

CATASAUQUA, PA. • SAND SPRINGS, OKLA. • CASPER, WYO.



A \$95,000,000 Demonstration



This balance scale dramatizes a mighty forward stride in steam generation. It shows that one large tube weighs the same as six small tubes of the same length. But...and here is the big point...the six small tubes have $2\frac{1}{2}$ times the surface area of the one large one.

Controlled circulation* makes it safe and practical to build boilers with furnace wall tubes having approximately one-half the diameter and wall thickness of those used in natural circulation boilers. This provides such important advantages over natural circulation as—

- *Fifty per cent reduction in weight of steam generating surfaces for equivalent capacity.*

- *Less supporting steel, less building steel and less expensive foundations.*

- *Adaptability to higher steam pressures permitting better power station economy.*

- *Quicker starting up and shutting down.*

- *Greater safety.*

Acceptance of C-E Controlled Circulation Boilers at the highest level of engineering appraisal is now on the record in the form of contracts placed in the past 30 months by leading utilities from coast to coast and by the U. S. Navy for its newest class of destroyers. The total

investment represented by these orders is in excess of \$95,000,000.

Controlled Circulation—a Combustion contribution to American power practice—is another example of C-E's leadership in steam generation...a leadership that assures you of the most advanced design whether your steam needs call for controlled or natural circulation boilers...large or small...for heat, power or process.

*The controlled circulation boiler differs from the natural circulation boiler in that it employs mechanical means for establishing and controlling circulation.

ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT

B-638



COMBUSTION ENGINEERING—SUPERHEATER, INC.

Combustion Engineering Building • 200 Madison Avenue, New York 16, N. Y.



FROM FROZEN WASTE TO STEAMING JUNGLE

Travel to the
northernmost Army outpost —
in "shooting" distance of the Pole
— you'll find National
receivers on the job!

Slash your way
through the African jungle
to a movie company
on location — you'll find
National receivers
on the job!

Literally, you'll find National receivers all over the world — on Navy ships at sea — on South American mountain tops — in the offices of London's famed Scotland Yard — on hazardous expeditions like Kon-Tiki!

No wonder National is the number one choice of experienced amateurs — for top performance under all conditions, year in and year out!



ELECTRONIC EQUIPMENT AND COMPONENTS

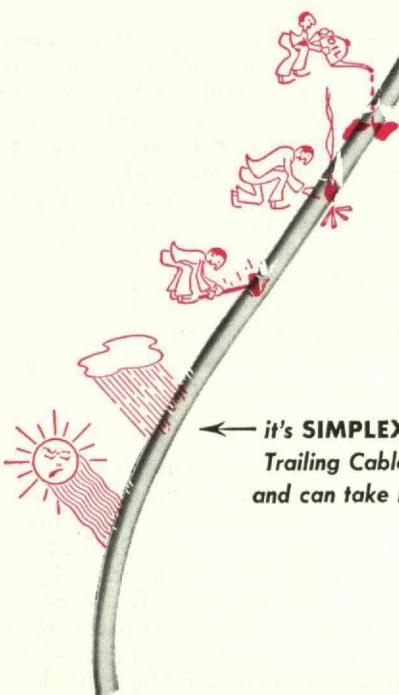
WHERE

Steady Power

COUNTS...

USE **TIREX**

SIMPLEX-TIREX



It's dig and dump, dig and dump, all day, every working day. That's the kind of operation that reduces costs and builds profits. Stop this shovel for one day and you come close to paying the price of a new cable. The output of this shovel is chiefly determined by the performance of its TIREX Trailing Cable. And output must be high.

Here's why TIREX Trailing Cable will stay on the job indefinitely. It has a tough neoprene armor that provides exceptional resistance to wear and tear. The smooth, dense jacket of TIREX Trailing Cable is a product of the *cured-in-lead* process that provides excellent resistance to abrasion, snagging and crushing. TIREX Trailing Cable offers a balanced resistance to oils, grease, moisture, flame and sunlight.

Specify and get TIREX Trailing Cable for this important reason: It is always on the job — always ready to work. TIREX Trailing Cable is always marked for your protection. Contact your nearest Simplex representative or write for more complete information.

Simplex

WIRES & CABLES

TIREX

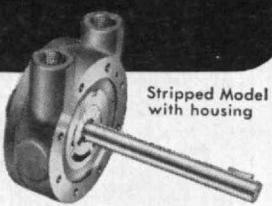
CORDS AND CABLES

are made only by the

SIMPLEX WIRE & CABLE CO., 79 Sidney Street, Cambridge 39, Massachusetts

COMPACT

automatic
reversing
vane pumps



You can make these compact pumps an integral part of your machines. They're automatic reversing . . . discharge in one direction, supply coolant or lubricant continuously regardless of shaft rotation. Direction of discharge changed easily in field.

Brown & Sharpe Automatic Reversing Vane Pumps in *Stripped Models without housing* offer minimum projection from machine surfaces . . . designed for use when suction and discharge ports can be incorporated in machine castings. *Stripped Models with housings* are easily installed when ports cannot be designed into machine, or when outside piping is desirable. *Complete pumps also available.* Sizes: 2½, 5, and 11½ gpm.

Write for Bulletin. Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A. Buy through your local Distributor.

Brown & Sharpe BS

ARTISAN
METAL PRODUCTS INC
EQUIPMENT FABRICATORS
WALTHAM
MASS USA

THE HALLMARK
of
SUPERIOR
EQUIPMENT

Artisan engineers and workers are skilled in the techniques of metal working. Their combined knowledge and experience in engineering and building special equipment and machinery have been of value to many leading mechanical and process industries.

Write for a copy of "Process Equipment". For a qualified engineer to call to discuss your equipment requirements, telephone WAltham 5-6800 or write to: — James Donovan, '28, General Manager.

AUTOCLAVES
CONDENSERS AND
HEAT EXCHANGERS
DISTILLATION
EQUIPMENT
EXPERIMENTAL
EQUIPMENT
EVAPORATORS
MIXERS
JACKETED KETTLES
PIPE, PIPE COILS,
AND BENDS
REACTORS
SPECIAL MACHINERY
TANKS

Artisan

METAL PRODUCTS, INC.

73 POND STREET, WALTHAM, (Boston 54) Mass.

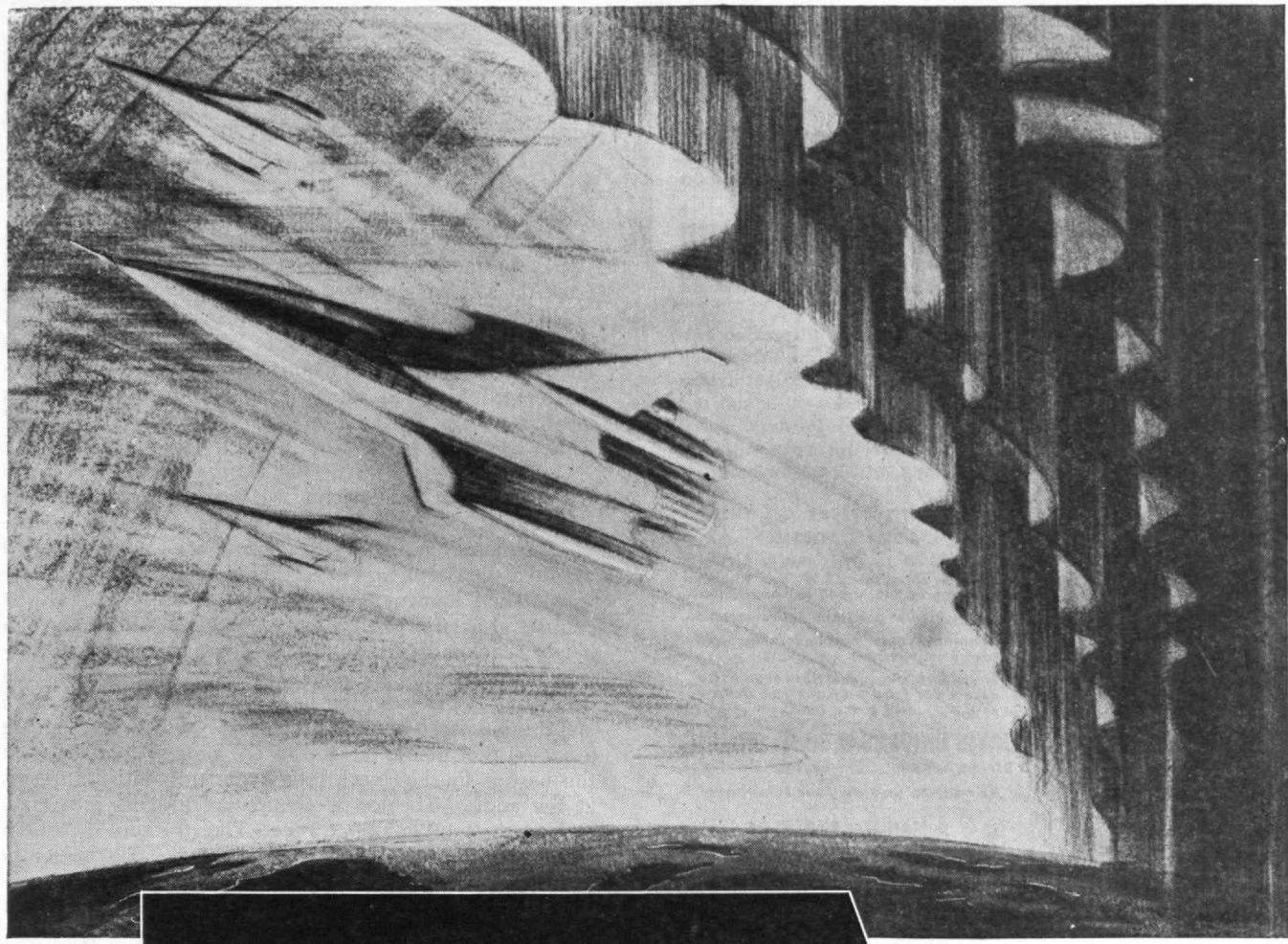
THE TABULAR VIEW

Nuclei in Action. — At the conclusion of World War II, competent physicists predicted the impending utilization of nuclear reactions for the production of power for peaceful, industrial uses. A program for accelerating industrial use of power from nuclear reactions is discussed (page 358) by PROFESSOR MANSON BENEDICT, '32, of the Department of Chemical Engineering. After receiving a B.S. degree in chemistry from Cornell University in 1928, Professor Benedict came to M.I.T. where he received the S.M. and Ph.D. degrees in 1932 and 1935. From 1938 to 1942 he worked with the M. W. Kellogg Company, and for the next four years was with Kellex Corporation. Prior to his return to Cambridge in July, 1951, as professor of nuclear engineering at M.I.T., and scientific director of National Research Corporation, Dr. Benedict was in charge of the operations analysis staff of the Atomic Energy Commission. The article has been adapted from an address given by Dr. Benedict before the Northeastern Section of the American Chemical Society and the Chemical Engineers Club of Washington, D.C. A condensation of this address appeared in the March 9, 1953, issue of *Chemical and Engineering News*.

Electrons at Rest. — Sometimes science turns somersaults, and a long-forgotten development assumes renewed importance. Such, for example, is the case with static electricity which assumes new importance as a result of developments in devices of modern technology. The history of static electricity is reviewed (page 363) by SIDNEY M. EDELSTEIN, '32, whose article in this issue will be followed by a companion piece on static electricity in the textile field. Mr. Edelstein, a former research associate for the American Association of Textile Chemists and Colorists, is now technical director of the Dexter Chemical Corporation. Mr. Edelstein has been secretary of the Division of History of Chemistry of the American Chemical Society for a number of years.

Research for Systems. — For all its outstanding successes during the past 350 years, science hasn't found answers to all of our problems. The field of its activity is expanding, however, and a new tendril, called operations research, helps administrators to find the best possible solutions to many problems in human activity, as PHILIP M. MORSE points out (page 367). Dr. Morse has been associated with the Institute's Department of Physics — where he is now professor of physics — since 1931. During World War II Professor Morse headed a group of scientists engaged in operational research, so that his present article has the maturity of a decade of experience. Dr. Morse was one of the originators, and the first director, of the Brookhaven National Laboratory at Upton, Long Island, N.Y.

Sailing on Glass. — Water and glass are mixing on the Charles River this spring as a fleet of 40 new Fiberglas dinghies gets its first real workout. The new boats are enthusiastically endorsed by Tech sailors, as Walter C. Wood, '17, Sailing Master, records (page 372). Mr. Wood has been associated with sailing at the Institute since 1936, except during the years of World War II when he was instructor in sailing at the U.S. Coast Guard Academy in New London, Conn., and earned the rank of lieutenant commander. The Fiberglas boats, comprising Technology's newest sailing fleet, were designed by George Owen, '94, Professor of Naval Architecture, Emeritus.



BEYOND THE HORIZON....

Progress in reaction-motor propulsion becomes possible only as the metallurgist supplies new alloys to withstand the stresses, temperatures, and corrosive attack developed by new rocket fuels.

Molybdenum additions to many alloys are known to improve strength at high temperatures. For this reason Molybdenum will be used more and more in the reaction motors of the future.

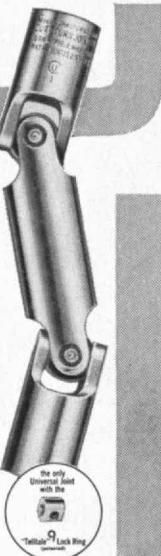
Climax furnishes authoritative engineering data on Molybdenum applications.

Climax Molybdenum Company
500 Fifth Avenue · New York City 36 · N.Y.

Perfect Balance

Each of the elements in a Curtis Joint is precisely proportioned in dimensions, heat treatment and steel composition to provide balanced performance.

CURTIS UNIVERSAL JOINTS



One advantage of this integrated balance is demonstrated in laboratory tests which prove that Curtis standard stock universal joints — although not specifically intended for high speed application — perform successfully at speeds up to 3,000 or 4,000 r.p.m.

ONLY CURTIS OFFERS ALL THESE ADVANTAGES

Availability — 14 sizes always in stock; bored or unbored hubs, 6" hub diameter joints or special machining to specifications.

Simplicity—fewer parts, simpler construction.

Government Tests — complete equipment for government tests in our plant.

Not sold through distributors; write direct for free engineering data and price list.

CURTIS UNIVERSAL JOINT CO., INC.

8 Birnie Avenue Springfield, Mass.

As near to you as your telephone

A MANUFACTURER OF
UNIVERSAL JOINTS SINCE 1919

RAYTHEON

your prime source
of information
and assistance
right down this list

SPECIAL TUBE AND
TRANSISTOR APPLICATION
ENGINEERING SERVICE AT

Newton, Mass. Bigelow 4-7500
New York WHitehall 3-4980
Chicago NAtional 2-2770
Los Angeles Richmond 7-5524

RAYTHEON MANUFACTURING COMPANY

Receiving Tube Division

55 CHAPEL STREET, NEWTON 58, MASS., Tel. BIGELOW 4-7500

MAIL RETURNS

Construction Misconstrued

FROM CHARLES W. SHERMAN, '90:

As a former assistant engineer of the Boston Water Works and later of the Metropolitan Water Works, I was astonished at the caption for the illustration on page 306 of the April Review. Actually, the tower shown enclosed the first standpipe of the Boston Water Works, and was built in 1870. Its only connection with works of the Eighteenth Century comes from the fact that it was located within the area of the "Roxbury High Fort," which was built in 1775.

A Short Description of the Boston Water Works by Desmond Fitzgerald, who was superintendent of the Western Division of the Boston Water Works, states:

"Roxbury Standpipe: The standpipe built in 1870 occupies the site of an old earthwork of the Revolutionary war. [Then known as Roxbury High Fort. C.W.S.] It consists of an iron shell 5 feet in diameter and 80 feet in height, enclosed in a handsome circular tower of brick-work with granite trimmings. There is a space 3 feet wide between the pipe and the brick wall, in which there is a spiral staircase leading to a lookout at the top, having a floor 3 feet below the top of the pipe. The exterior at the base is finished with four pediments with buttresses at the angles. The top is octangular and has a steeple, making the total height 133 feet. The structure is painted white and is a conspicuous object, but is no longer in use. Before the high-service reservoirs were built, however, it played an important part in the distribution of the high-service water."

Belmont, 78, Mass.

[Photographer Hanson adds the concluding paragraph. — Ed.]

FROM RAYMOND E. HANSON:

I do hope the caption on the reverse side of my print was not misleading. Mr. Sherman is correct that the tower was not built in the Eighteenth Century. Its connection with the Eighteenth Century is solely from the fact that it stands upon the site of the Roxbury Revolutionary Fort, built at the siege of Boston in 1775.

Boston, Mass.



Power house of Chas. Pfizer & Company, Inc., Groton, Conn.
Baker & Spencer, Inc., Engineers

26 contracts in the past 25 years
for Chas. Pfizer & Co., Inc.

W. J. BARNEY CORPORATION

Founded 1917
101 Park Avenue, New York

INDUSTRIAL CONSTRUCTION

Alfred T. Glassett, '20, President



Things are different—up there!

You would be amazed at the tricks nature plays in the stratosphere

As aviation progress has carried man farther into the upper air, he has found that nature has many tricks up her sleeve in the stratosphere. Many things that worked well on the ground wouldn't do as well, or failed completely, in the space beyond the clouds. Things are truly different up there.

CARBON BRUSHES ARE AN EXAMPLE—These brushes are the contact points that carry electricity between moving and stationary parts of motors and generators. They're in electric razors, sewing machines, huge diesel locomotives—and in modern aircraft.

THEY COULDN'T STAND ALTITUDE—Today's high-flying planes require literally hundreds of small electric motors and many carbon brushes. Here was one of nature's quirks, for brushes which worked well on the ground and at lower altitudes couldn't take the thin, dry air of the stratosphere. They'd spark and quickly disintegrate. And if the brushes failed, the motors also would fail.

UCC FOUND THE ANSWER—The people of Union Carbide attacked this problem. Through research they developed special carbon brushes that worked uniformly well at all altitudes, making stratosphere flying a practical reality.

OTHER AIDS TO FLYING—Better carbon brushes that keep motors and generators running, alloy metals that stand the terrific heat of jet engines, plastic insulation for high-altitude wiring, and oxygen that provides the breath of life in the upper air—these are but a few of the many UCC products that are helping aviation reach new heights.

STUDENTS and STUDENT ADVISERS: Learn more about the many fields in which Union Carbide offers career opportunities. Write for the free illustrated booklet "Products and Processes" which describes the various activities of UCC in the fields of ALLOYS, CARBONS, CHEMICALS, GASES, and PLASTICS. Ask for booklet C-2.

**UNION CARBIDE
AND CARBON CORPORATION**

30 EAST 42ND STREET

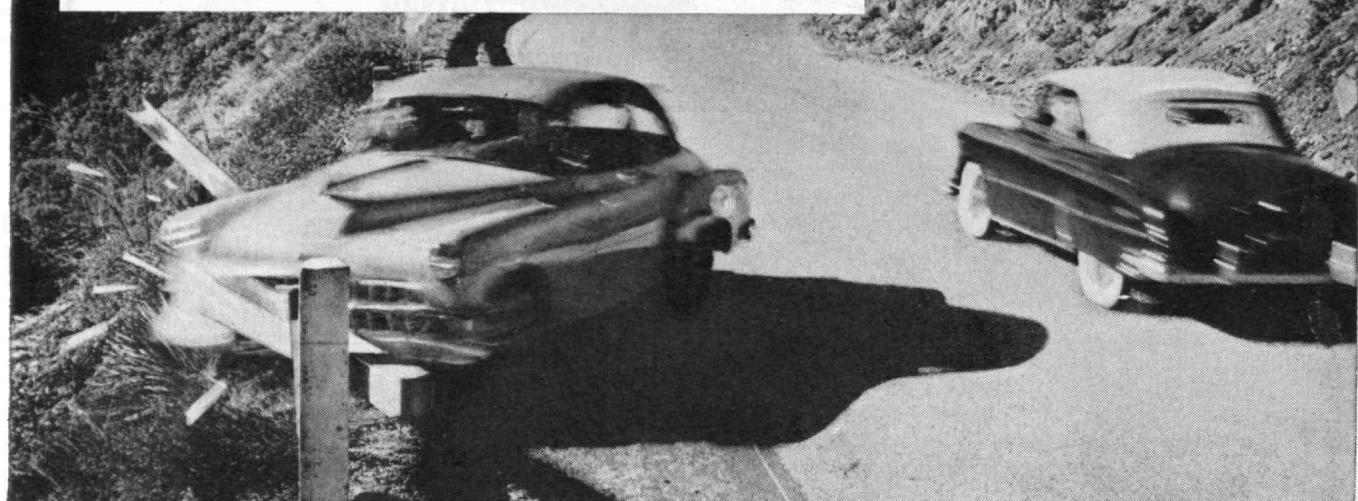


NEW YORK 17, N. Y.

— *UCC's Trade-marked Products of Alloys, Carbons, Chemicals, Gases, and Plastics include* —

NATIONAL Carbons • ACHESON Electrodes • EVEREADY Flashlights and Batteries • PRESTONE and TREK Anti-Freezes
ELECTROMET Alloys and Metals • HAYNES STELLITE Alloys • PREST-O-LITE Acetylene • PYROFAX Gas
DYNEL Textile Fibers • BAKELITE, KRENE, and VINYLITE Plastics • LINDE Oxygen • SYNTHETIC ORGANIC CHEMICALS

Which man just had a blowout?

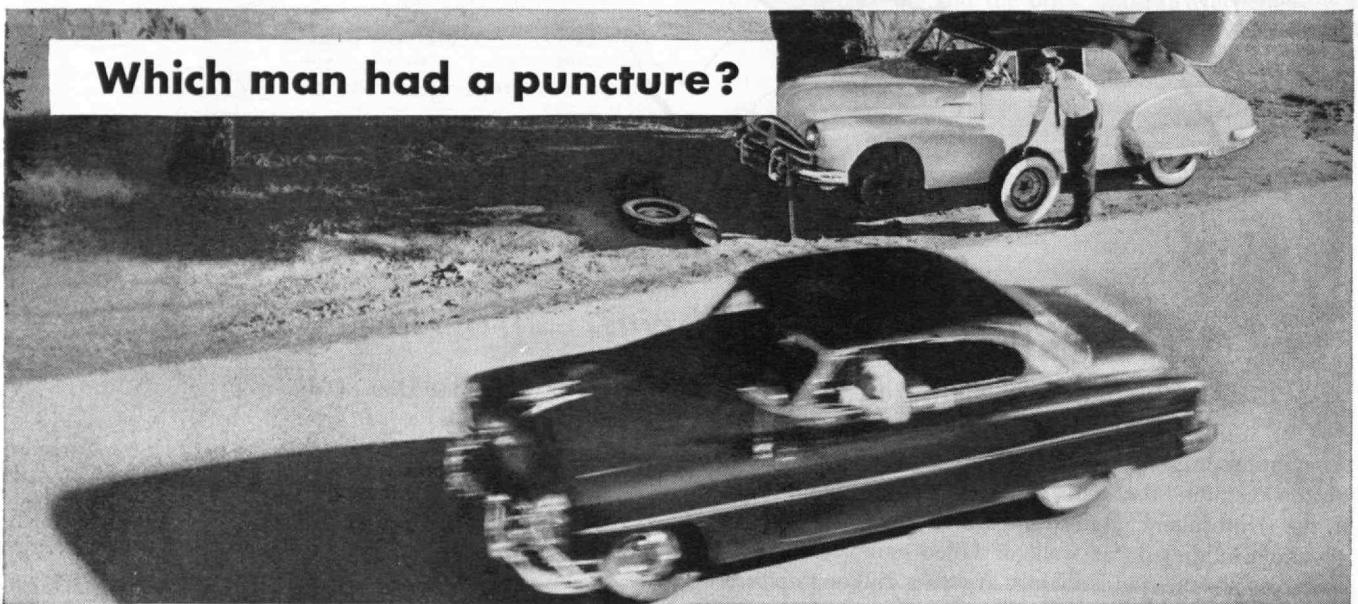


BOTH OF THEM!—but only one man is in danger! When his single-chamber tire and tube ripped open, his car dropped to the rim and lurched out of control! He's lucky if he gets by with just a repair bill.

The other man is coming to a safe, controlled stop on double-chamber LifeGuards. When the outer chamber blew, he had a life-saving reserve of air in the inner chamber. You can't get better protection to save your life!

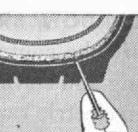
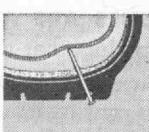


Which man had a puncture?



BOTH OF THEM!—but only one man has the dirty job of changing a tire. The other man is riding on puncture-sealing New LifeGuard Safety Tubes. He'll pull out the nail; the sealant will seal the hole without loss of air.

You save 20% to 43% with LifeGuards. For this is the only 100,000-mile re-usable protection! You can re-use them in 3 or more sets of tires. You spread the cost for real savings. Goodyear, Akron 16, Ohio.



NEW LIFEGUARD SAFETY TUBES



America needs better, safer roads. Let's bring them up to PAR.

For the longest mileage, the safest mileage, the most comfortable ride on wheels, get Goodyear tires equipped with LifeGuard Safety Tubes. See your Goodyear dealer.

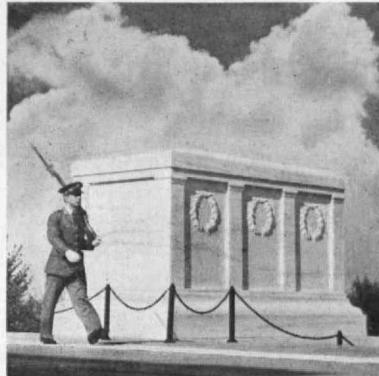
**BLOWOUT-SAFE! PUNCTURE-SAFE!
100,000-MILE RE-USABLE PROTECTION!**

by

GOOD YEAR

LifeGuard, T. M.—The Goodyear Tire & Rubber Company, Akron, Ohio

THE TECHNOLOGY REVIEW



H. Armstrong Roberts

"Sleep the sleep that knows
not breaking,
Morn of toil, nor night of
waking."

—Sir Walter Scott

THE TECHNOLOGY REVIEW

TITLE REGISTERED, U. S. PATENT OFFICE

EDITED AT THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY

CONTENTS for May, 1953

Vol. 55, No. 7

BEACH AT AMALFI • <i>Photograph by Jacobs from Three Lions</i> ... THE COVER	
ENTRANCE TO NAVAL ARCHITECTURAL BUILDING • <i>Photograph by Raymond O. Hanson</i> FRONTISPICE	356
INDUSTRIAL NUCLEAR POWER BY MANSON BENEDICT	358
<i>A program is suggested to accelerate production of power for industrial purposes through use of nuclear reactions</i>	
HISTORY OF STATIC ELECTRICITY BY SIDNEY M. EDELSTEIN	363
<i>Progress in the oldest branch of electricity is reviewed in the light of its current technological importance</i>	
OPERATIONS RESEARCH BY PHILIP M. MORSE	367
<i>By applying the methods of science to human problems, scientists and engineers assist administrators to reach wise decisions</i>	
M.I.T. HAS NEW SAILING FLEET BY WALTER C. WOOD	372
<i>Technology's new fleet of 40 glass-bottom sailing craft initiates a new era in collegiate sailing</i>	
THE TABULAR VIEW • <i>Contributors and Contributions</i>	350
MAIL RETURNS • <i>Letters from Review Readers</i>	352
THE TREND OF AFFAIRS • <i>News of Science and Engineering</i>	357
THE INSTITUTE GAZETTE • <i>Relating to the Massachusetts Institute of Technology</i>	374

Published monthly from November to July inclusive on the twenty-seventh of the month preceding the date of issue, at 50 cents a copy. Annual subscription, \$8.50; Canadian and foreign subscription, \$4.00. Published for the Alumni Association of the M.I.T.: Edwin D. Ryer, President; H. E. Lobdell, Executive Vice-president; Hugh S. Ferguson, Dwight C. Arnold, Vice-presidents; Donald P. Severance, Secretary-Treasurer. Published at Hildreth Press, Inc., Bristol, Conn. Editorial Office, Room 1-281, Massachusetts Institute of Technology, Cambridge 39, Mass. Entered as second-class mail matter at the Post Office at Bristol, Conn. Copyrighted, 1953, by the Alumni Association of the Massachusetts Institute of Technology. Three weeks must be allowed to effect change of address, for which both old and new addresses should be given.



THE TECHNOLOGY REVIEW

Vol. 55, No. 7

May, 1953



The Trend of Affairs

Sunbeams and Kilowatts

NATURE'S way of converting solar into chemical energy is mainly by means of the familiar reactions of photosynthesis which take place in living organisms. In this process the sunlight, absorbed by chlorophyll, converts carbon dioxide and water into oxygen gas and organic materials such as cellulose and sugar. The energy of the sunlight stored in this way is utilized by burning the organic products (such as coal and oil) in air, thereby releasing chemical energy as heat and producing the original reactants, carbon dioxide and water.

In an integrated program of research designed to explore the possibilities of employing non-living systems for storing sunlight, a simple way has been found to convert the sunlight into high-grade chemical energy available in storage. The program was begun several years ago by Lawrence J. Heidt, Associate Professor of Physical Chemistry, assisted by grants from the Godfrey L. Cabot Fund of M.I.T. and the Charles F. Kettering Foundation.

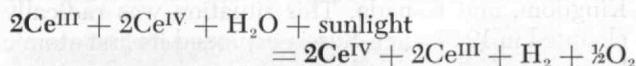
Those working with him on the program at the present time are two research associates, Edwin W. Abrahamson and Kenneth A. Moon, '52; four graduate students, David E. Bosley, John B. Flynn, Thomas J. Hayes, and Alan F. McMillan; and four technical assistants, Catherine M. Colman, Joan C. Des Roches, Elizabeth M. Malone, and Beatrice M. Neary.

Now, the new method converts less than 0.1 per cent of absorbed sunlight into high-grade chemical energy, but it may be that efficiency can be increased so that the method may become economically important.

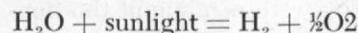
► On the opposite page may be seen the entrance to M.I.T.'s Pratt School of Naval Architecture and Marine Engineering at 55 Massachusetts Avenue, as photographed by Raymond E. Hanson.

The new, photochemical method consists of the photochemical decomposition of water by sunlight absorbed by an inorganic water solution of cerous (Ce^{III}) and ceric (Ce^{IV}) perchlorates and perchloric acid ($HClO_4$).

That part of the sunlight absorbed by the cerous ions reduces the water (or hydrated protons) to hydrogen and oxidizes cerous to ceric ions. That part of the sunlight absorbed by the ceric ions, oxidizes the water (in particular the oxygen part of the water joined to the ceric ions) to oxygen, and the ceric ions are reduced to cerous ions. The reactions are:



for which the net reaction is:



The cerous and ceric ions play the part of the carriers of the sunlight in much the same way that chlorophyll plays this part in the natural process.

The energy of the sunlight, converted into chemical energy by the new process, is stored in the hydrogen and oxygen gases. By burning these gases at temperatures above 2,500 degrees C. to form water, such energy can be utilized very efficiently.

The photochemical reactions involved in the new process are electron transfer reactions; that is, the photoactivated cerous ions transfer their electrons to the hydrogen in the water to produce ceric ions and hydrogen gas, and the photoactivated ceric ions accept electrons from water molecules to produce cerous ions and oxygen gas.

In order to utilize the new method for practical purposes, it is necessary to learn how to increase the fraction of the light consumed in the decomposition of water at the expense of the light which otherwise would be consumed by the direct transfer of electrons between the light-absorbing species.

Industrial Nuclear Power

Industrial Power from Nuclear Reactions Has Taken Longer

to Attain Than Was Originally Expected. A Program

to Accelerate This Achievement Is Suggested

By MANSON BENEDICT

THE Atomic Energy Act of 1946, popularly known as the McMahon Act, gives the government exclusive rights to own fissionable material, nuclear reactors, plants for producing fissionable material or weapons, and forbids granting patents in certain parts of the atomic energy field. This law created the Atomic Energy Commission as the administrative agency with responsibility for directing research, development, engineering, and production in the field of nuclear weapons and nuclear power. The law directed the Atomic Energy Commission to advise the President and Congress when the state of nuclear power development became such as to warrant revision of the act. The law in effect gave the government a revocable monopoly in the atomic energy field.

It is important to mention some of the reasons which were responsible for these provisions of the McMahon Act, because many of these reasons are now obsolete:

1. At the time the act was passed, knowledge and facilities for producing atomic weapons were the exclusive possession of the United States, the United Kingdom, and Canada. This situation was radically changed in 1949 when Russia exploded its first atomic bomb.

2. Negotiations for the international control of atomic energy were pending at the time the act was passed. It was thought that a government monopoly would be needed to satisfy the United States obligations if the control treaty came into effect. The prospects of the United Nations adopting international control of atomic energy are now very dim indeed.

3. It was thought that strict government control would be needed to insure against a small group of industrial interests obtaining preponderant control of a new and valuable technical field in which the basic development had been made with public funds. It is now recognized that effort by many companies will be required, and that the effort required is so great that no one company is likely to gain a monopoly.

4. It was originally hoped that profitable nuclear power would be only a few years off. We now know that many more years will be required.

Organization of Nuclear Power Development in the United States

In the United States the Atomic Energy Commission directs the entire atomic energy program. It owns

plants, raw materials, intermediates, and weapons. Contracts for research, development, engineering, and production are largely on a cost-plus-fixed-fee basis. None of the special materials produced for the Atomic Energy Commission (such as heavy water, uranium metal, U-235, or plutonium) is being paid for at a fixed price, and Atomic Energy Commission contractors are not permitted to realize a profit from process improvements or required to take a loss from production inefficiencies. Many people feel that this has increased the cost of nuclear weapons and has delayed reduction in the cost of nuclear power.

This is a situation about which neither the Atomic Energy Commission nor private industry has been altogether happy. The Atomic Energy Commission has invited companies to have officials cleared and to discuss ways in which private industry might take over parts of the nuclear weapons or nuclear power program. The Atomic Energy Commission has created an office of industrial development to facilitate contacts with industry. Following a suggestion of Charles A. Thomas, '24, chairman of the American Chemical Society and President of the Monsanto Chemical Company, the Atomic Energy Commission has invited five "industrial study groups" to explore the whole field of reactor technology and to submit proposals for participation of private industry in the production of plutonium and power. Several of these groups have offered to construct and operate such dual-purpose plants, some under the existing law, others after amendments have been effected.

Technical Progress in United States

Everyone agrees that it is technically feasible to produce power from nuclear fission. Yet, none has been produced except for the experimental production of 250 kilowatts of electric power by the Experimental Breeder Reactor at Arco, Idaho. Our existing plutonium-producing reactors at Hanford, Wash., throw tremendous amounts of heat away to the Columbia River, and those being built near Augusta, Ga., will throw theirs away to the Savannah River. Despite this, two of the study groups have concluded that power could be economically produced along with plutonium, in modifications of these reactors. The justification for the present waste of power is that the urgency of our need for atomic weapons has required production of plutonium at the earliest pos-

sible date. There has not been time for the limited additional development and design effort needed to adapt our present plutonium production reactors to the simultaneous production of power, and the Atomic Energy Commission has not been willing to risk the possible delays in starting up new reactors of modified design. Hence, the paradox: Although military demand for plutonium would permit production of nuclear power at a profit, this demand is so acute that there has not been time to learn how to produce nuclear power dependably.

Although the military situation has retarded development of industrial nuclear power as an adjunct of plutonium production, it has accelerated this development through promotion of nuclear reactors for the propulsion of naval vessels and aircraft. Westinghouse Electric Corporation expects to have the first reactor for submarine propulsion in operation in 1954, and is at work on a reactor for driving a large ship. General Electric Company is developing another type of submarine reactor. General Electric Company and Pratt and Whitney Aircraft Company each are conducting studies of aircraft reactors. These efforts will solve many of the technical problems of nuclear power plants, but are not expected to reduce costs to the point where a nuclear reactor producing power only, without plutonium, can compete economically in this country with conventional central-station power plants burning coal or oil. These efforts will not give us experience with the problems of tying a nuclear power plant into an electric distribution network. The basic fact is that in the United States, at the present time, there is no full-scale engineering project aimed directly at the eventual production of industrial nuclear power from uranium at costs competitive with other fuels. The reactor developments in this country aim instead at plutonium production or power for military purposes.

Other Countries

What is the situation in other countries? Canada has formed a government-controlled corporation whose objective is the development and production of nuclear power. Australia and Belgium, two of the countries which supply the United States with uranium, and which pay a high price for conventional fuels, are interested in industrial nuclear power and wish to receive from us scientific and engineering information about reactors as a consideration in sending us uranium. England is engaged in a dual-purpose development, producing plutonium for nuclear weapons and aiming at industrial nuclear power to supplement shortages of power produced from scarce and relatively costly conventional fuels. Russia is producing nuclear weapons; her nuclear power objectives are not public knowledge.

The important facts regarding other countries are these: (1) the United States no longer has the monopoly on plutonium-production technology which it enjoyed when the McMahon Act was passed; and (2) there are countries in the world where production of economic nuclear power is taken more seriously than it is in the United States, and where the art may soon be more advanced.

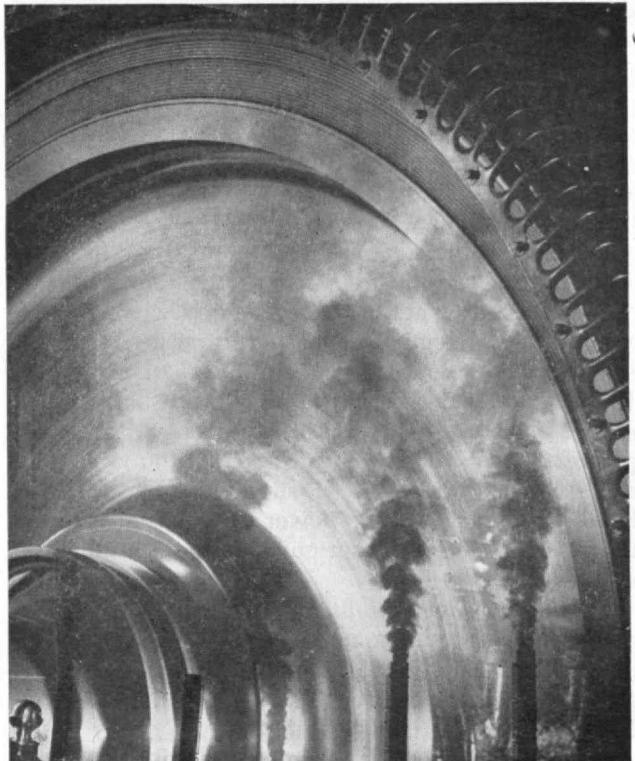
Technical Background of Nuclear Power

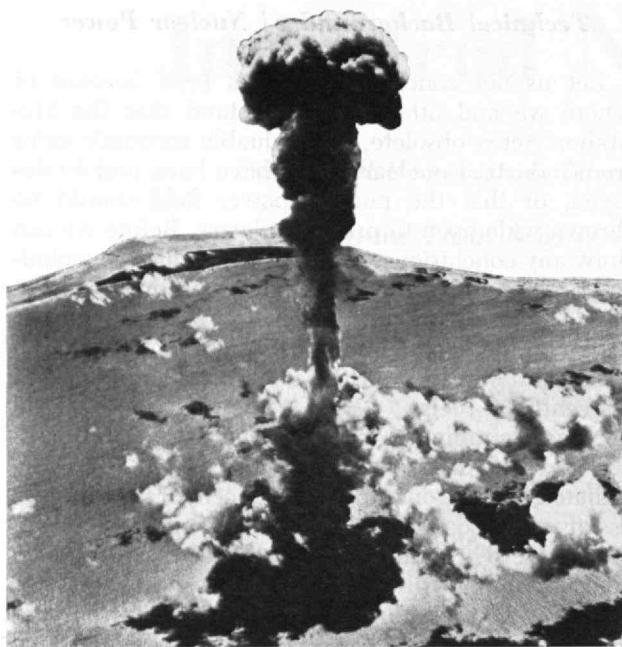
Let us not conclude from this brief account of where we and other countries stand that the McMahon Act is obsolete, that valuable economic gains from industrial nuclear power have been unduly delayed, or that the nuclear power field should be thrown wide open to private industry. Before we can draw any conclusions we need to examine the technical background for nuclear power production, economic factors in the production of power from nuclear fission on the one hand and conventional fuels on the other, and statistics on the reserves of uranium and conventional fuels.

Natural uranium consists of one part of uranium-235 and 139 parts of uranium-238. When U^{235} is irradiated by neutrons, about 85 per cent of it undergoes fission, and about 15 per cent of it is converted to non-fissionable by-products. The net effect is to produce 30,000 million British thermal units of energy per pound of U^{235} consumed, 2.1 moles of neutrons per mole of U^{235} consumed, and 2.0 moles of radioactive fission products per mole fissioned. Let us consider each of these three products in turn.

The energy released per pound of U^{235} consumed is about 2.2 million times greater than the heat of combustion of coal, and is, of course, the reason for the great interest in nuclear power. Although, at the instant of release, this fission energy is in the form of high-speed particles at temperatures of several million degrees, the only practical way known of using this energy is to slow the particles down and convert the energy to heat at conventional temperatures. The heat is then used to generate steam or heat compressed gas in the same way that the combustion of a chemical fuel is used in a steam power plant or gas turbine. Because of this degradation, only about 30 per cent of the fission energy can be converted to

William M. Rittase





Harold M. Lambert

power. Nevertheless, the amount of nuclear fuel required for power generation would be incredibly small, by conventional standards. For example, a 300,000-kilowatt power plant which burns 5,000,000 pounds of coal per day, would consume only 2.4 pounds of nuclear fuel per day.

Because of the low fuel consumption per unit of power produced, nuclear power plants may run for a long time without refueling, and fuel transportation costs, which are a vital factor in the economics of conventional power, are insignificant in nuclear power economics. Particularly favorable applications of nuclear power will therefore be to remote locations, or to plants which are to release a lot of energy from a single charge of fuel, such as military aircraft or naval vessels. Since nuclear power plants do not consume air, they are of especial value in submarines.

It is important to note that a nuclear power plant differs from a steam power plant only in its heat-producing unit. The turbine, generator, and electrical distribution system of each is the same. The nuclear reactor, heat exchanger, and nuclear-fuel processing system of a nuclear power plant is substituted for the furnace, boiler, and coal-, air-, and ash-handling equipment of the steam power plant.

From time to time we hear of power shortages. In the United States, at the present time, power shortages are caused by a temporary lack of power generating or distribution equipment, rather than by a lack of fuel. The availability of heat from nuclear fission will not relieve such power shortages, because a nuclear power plant still needs the generating and distribution equipment causing this type of shortage. On the other hand, in countries where power shortages are caused by lack of fuel, heat from nuclear fission might well relieve the shortage.

Of the 2.1 moles of fission neutrons per mole of neutrons absorbed, one mole is consumed to keep the nuclear reaction going. In a suitably designed reactor, some of the remaining 1.1 moles may be captured by U^{238} to produce plutonium-239. Like U^{235} , Pu^{239} undergoes fission under neutron irradiation, and may

also be used as a nuclear fuel. If the neutrons are used so effectively that more than one mole of plutonium is produced per mole of U^{235} consumed, we have the possibility of burning up our U^{235} fuel, and at the same time producing more fuel than we have consumed. This process is known as breeding. By repeating the operation with plutonium, in place of U^{235} , we have the possibility of converting to plutonium and burning all of the uranium in nature, U^{238} as well as U^{235} , instead of just the one part in 140 which is U^{235} . The breeding process may theoretically also be carried out with thorium.

The first experimental reactor aimed at testing the feasibility of breeding is now being operated in Idaho. These experiments will have a profound effect on the amount of nuclear fuel available and on the contribution of fuel to the cost of nuclear power.

Walter H. Zinn¹ has recently pointed out that even if breeding is not successful, the amount of available nuclear fuel can be extended considerably by converting most (say 80 per cent) of the U^{235} consumed to plutonium, then consuming this plutonium and producing almost as much again (say 80 per cent) and repeating the operation until the amount of fuel burned is several times as great as the amount of U^{235} originally present. This process is called regeneration.

The radioactive fission products, and the radiation given off during fission, have been the curse of the nuclear power business. They are responsible for the massive shielding surrounding reactors, the shielded and remotely operated chemical plants used for treating reactor products, and the expensive facilities used for storing and disposing of reactor wastes. The amount of radioactivity associated with a nuclear power plant is staggering. A power plant liberating heat at the rate of a million kilowatts, and producing power at the rate of 300,000 kilowatts, will have associated with it radioactivity equivalent to six billion grams of radium.

Power Production Economics

We have seen that the two main differences between a nuclear and a conventional power plant are: (1) the use of uranium-235 or plutonium as fuel in place of coal or oil; and (2) the substitution of a nuclear reactor and associated facilities for the boiler and coal-, ash-, and air-handling equipment. Let us see what this tells us about the cost of generating electricity in a nuclear power plant.

The lowest rate charged industrial consumers of large blocks of high-voltage power in the Boston area is around 1.2 cents per kilowatt-hour. The domestic rate is three cents per kilowatt-hour. How much of this is due to the cost of the coal and oil now used by Boston utilities?

Currently, their average fuel bill is \$9.82 per ton of coal containing 14,500 British thermal units per pound. This is equivalent to paying \$0.34 for a million British thermal units of heat. Since a modern steam-electric plant uses about 10,000 British thermal units of heat per kilowatt-hour of electricity delivered to its customers, conventional fuels now contribute only 0.34 cent to the cost of a kilowatt-hour of electricity.

¹ Walter H. Zinn, *Nucleonics*, September, 1952, page 8.

This is less than 30 per cent of the cost of power to a large industrial user, and less than 12 per cent of the cost to domestic consumers. Even if nuclear fuels were free, and nuclear power plants cost no more than conventional plants, the savings in power costs would not be outstanding. And these two premises are over-optimistic.

What would be the fuel bill in a nuclear power plant? Official figures on the price of natural uranium are not available, but Dr. Zinn has postulated a price of \$35.00 per pound, which will do for our purpose. The cost of heat from nuclear fission will depend on the fraction of natural uranium which can be utilized as fuel. This fraction is very low in the type of power plant being developed for submarine use, which uses enriched U²³⁵. Only 1/140 of natural uranium is U²³⁵, and Zinn has postulated that it is economic to utilize only about half of that. Thus, fuel for such a reactor will cost at least 280×35 , or \$9,800 per pound. Since the heat of fission of U²³⁵ is 30,000 million British thermal units per pound, the cost of heat from enriched U²³⁵ will be \$0.33 per million British thermal units, which is nearly the same as we now pay for heat from coal in Boston. There will be no saving in fuel costs in a reactor burning enriched U²³⁵.

Regeneration would make more efficient use of uranium. Zinn has estimated that as much as 1 per cent of natural uranium might be converted to heat in this way. This would drop the cost of heat from nuclear fission to $\$35.00 \times 100/30,000$, or \$0.12 per million British thermal units. Finally, if breeding were feasible, perhaps 50 per cent of natural uranium might be converted, and heat from nuclear fission would cost only 0.24 cent per million British thermal units. Fuel costs would add only 0.0024 cent per kilowatt-hour to the cost of electricity, a truly negligible quantity.

How much does the initial cost of power plant and distribution system contribute to the cost of electricity? Walker L. Cisler, President of the Detroit Edison Company, has estimated² that the initial cost of a large, efficient, modern steam-electric plant is \$158 per kilowatt of installed capacity, excluding the distribution system. The cost of the boilers and materials handling equipment which would be replaced by a reactor in a nuclear power plant, is \$77 per kilowatt, or less than half of the total. To translate these initial plant costs into electric costs, we will use a total annual charge against investment of 15 per cent, and a load factor of 50 per cent, that is, assume that 4,400 kilowatt-hours of electricity may be produced per year per installed kilowatt capacity. Then the contribution to electric power costs of the initial cost of the complete plant is $\$158 \times 0.15/4,400$ or 0.54 cent and the contribution of the part of the plant which might be replaced by a nuclear reactor is 0.26 cent.

It is generally agreed that a nuclear reactor will cost more than a conventional steam boiler plant of the same steam generating capacity, because of the complications introduced by the intense radioactivity of the reactor and spent fuel, and the special precautions

² Walker L. Cisler, "Economics of Nuclear Power" — talk delivered before National Industrial Conference Board, New York, October 17, 1952.

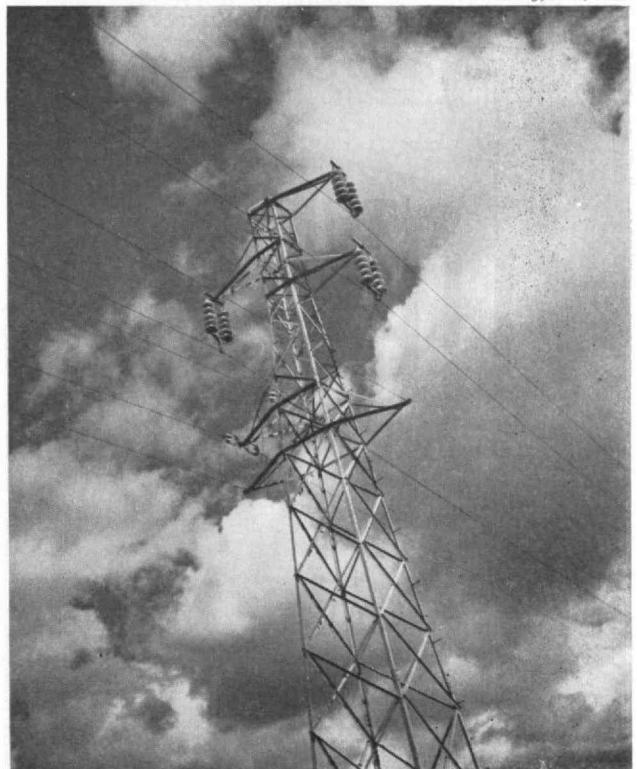
which have to be taken to conserve neutrons. It is easy to figure the maximum amount a utility could afford to pay for a nuclear power plant if it could burn nuclear fuel at no cost instead of coal at 0.34 cent per kilowatt-hour. The maximum increase in cost of the nuclear power plant allowable over that of a conventional power plant would be $\$0.0034 \times 4,400/0.15 = \100 per installed kilowatt capacity. The maximum cost for a nuclear power plant which would permit it to compete with coal in Boston at today's price would be \$258 per installed kilowatt.

And what is a nuclear power plant likely to cost? Donald H. Loughridge, Assistant Director of the Atomic Energy Commission's Division of Reactor Development, has inferred³ from unclassified data that the first submarine nuclear power plant now being built is costing around \$1,400 per installed kilowatt. Admittedly, this reactor costs more than a land-based power plant would because of the special requirements of a submarine power plant. Taking these factors into account, Dr. Loughridge has estimated that the cost of a nuclear power plant using present-day techniques (and not breeding) would be in the order of \$500 to \$600 per installed kilowatt. So, before nuclear fuels could compete with coal in Boston, it will be necessary to develop a successful breeding reactor and cut the cost of a nuclear power plant in half.

It is instructive to estimate the price of coal at which nuclear fuels would be competitive in a breeding nuclear power plant costing \$500 per kilowatt of installed capacity. The increased investment cost of \$342 per kilowatt for the nuclear plant would add $\$342 \times 0.15/4,400 = 1.16$ cents per kilowatt-hour to the cost of electricity. Thus, heat from coal would

³ Conference on Atomic Power, University of Chicago, December 2, 1952.

A. Devaney, Inc., N.Y.



have to cost \$1.16 per million British thermal units, and coal with a heating value of 29,000,000 British thermal units per ton would have to rise in cost to $\$1.16 \times 29 = \34 per ton, before it would be profitable to install a nuclear power plant instead of a conventional one.

Now there are places in the world where conventional fuels cost almost this much — in remote mountainous or polar regions, and in fuel-poor countries such as Holland, France, and Belgium. France, for example, which buys some coal at \$26 per ton, is seriously considering building a nuclear power plant. These are the places where the first industrial nuclear power plants will be built. The United States, with its abundant resources of relatively cheap coal, oil, and gas, will be one of the last places to profit industrially from nuclear power. This is true even of New England.

The economic attractiveness of nuclear power would be greatly improved if the United States government were able to guarantee to buy plutonium for military purposes at a price substantially above its fuel value. As a step in this direction, the Commonwealth Edison Company and the Public Service Company of Northern Illinois have proposed that they and the Atomic Energy Commission enter into a joint venture to produce plutonium and power, with the Atomic Energy Commission paying for and owning the reactor, and the private companies financing and owning the rest of the power plant. These companies believe that the cost of plutonium to the government would be lower than in present reactors not producing power, and the cost of power to the companies would be lower than in conventional power plants. And the nation as a whole would benefit from the practical experience with a nuclear power plant designed to be economical rather than to power a submarine or airplane. The advantages of such a venture are appealing, but the government has not yet approved it. Apparently, the Atomic Energy Commission

is uncertain that it will need the additional plutonium for a long enough time to justify investing in another major reactor facility. Also, the uncertainty as to when such a reactor of a new type might come into production may be a deterring factor. Finally, because of the large amount of fuel required and the limited demand for additional plutonium, not many power plants producing plutonium for military purposes would be built, so that this type of venture does not provide the basis for a broad nuclear-power industry.

Availability of Nuclear Fuels

Let us now consider whether enough nuclear fuel is available to fill a substantial part of our fuel requirements. The annual electric energy output of the United States was 400 billion kilowatt-hours in 1950, and according to the President's Materials Policy Committee, is expected to rise to 1,400 billion in 1975. To produce 400 billion kilowatt-hours of electric energy would require the consumption of 65 tons of nuclear fuel per year. The amount of uranium required would be around 18,000 tons per year in reactors burning enriched U²³⁵, 6,500 tons per year in regenerating reactors utilizing 1 per cent of the uranium, or 130 tons per year in breeding reactors utilizing 50 per cent of the uranium.

The rate at which uranium is now being produced is not available. The published qualitative comments of a few informed individuals suggest that the 130 ton per year estimated figure for breeders is attainable, but the requirements for regenerating reactors or reactors fueled with enriched uranium probably exceed the capacity of present uranium sources. Lord Cherwell, who advises Winston Churchill on scientific matters, has said, "The whole world is being searched for uranium, and 100 tons is quite a notable amount." Harry A. Winne, Vice-president of General Electric Company, has pointed out that the United States could produce 100 tons of uranium per year by recovery of the uranium present in the million tons of phosphate rock converted annually to phosphoric acid in this country.⁴

We thus conclude that for nuclear fuels to supply a substantial portion of this country's annual energy requirements will require the development of economic breeding reactors.

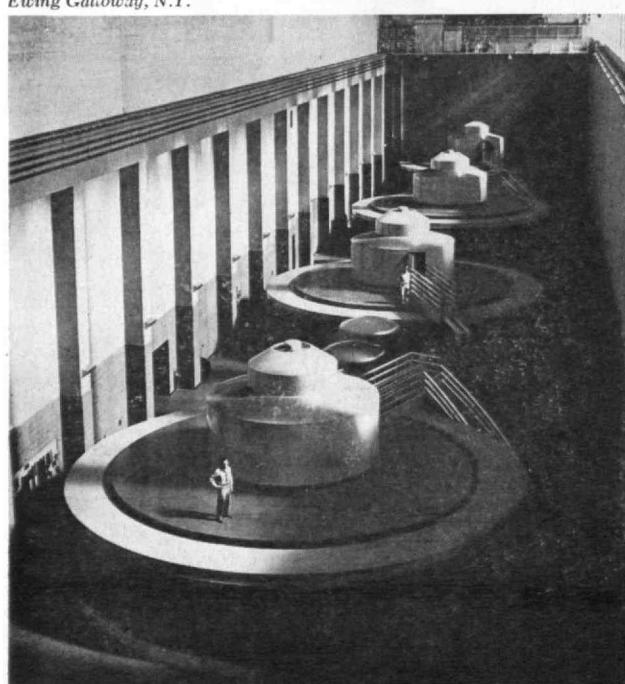
Authorities on the world's total reserves of coal and uranium are in general agreement that if economic breeding proves feasible, the total energy reserves in uranium and thorium will exceed those in coal. If breeding is not economic, uranium will be a useful, but relatively minor, energy source. For dealing with energy reserves, Palmer C. Putnam, '23, the Atomic Energy Commission's consultant on such matters, has introduced the unit Q, a billion, billion British thermal units. He estimates the world's reserves of oil to be 6Q, coal 30Q, and uranium and thorium 100 to 1,000Q, if 100 per cent utilized.

One other point which requires consideration is the number of years we have before we must supplement our resources of coal, oil, and gas with other

⁴ Talk before Machine Tool Conference of American Institute of Electrical Engineers, Albany, N.Y., October 30, 1952.

(Continued on page 386)

Ewing Galloway, N.Y.



History of Static Electricity

The Oldest Branch of Electricity Regains Importance

as the Result of New Applications and Problems

Arising in Fields of Modern Technology

By SIDNEY M. EDELSTEIN

EXACTLY 200 years ago last May the scientific world was agog over the latest investigation into the fundamentals of static electricity proposed by Benjamin Franklin — the drawing down of electricity from the clouds. Today our textile world is agog over the problem created by static electricity, yet our fundamental knowledge of static electricity is not much greater than it was during Franklin's time.

In ancient mythology there is the story of a fabulous bird, the phoenix. After living for hundreds of years, this bird made itself a nest in which it died by setting fire to the nest and burning itself alive. From its ashes there came forth another phoenix, a perfect replica of its father, to continue the same pattern of life. The science of static electricity is like such a bird. This science also developed and lived for hundreds of years only to die in the fire of disinterest. The new man-made plastics and fibers have again caused a wave of interest in static electricity, and have called forth a new phoenix, for the ideas and principles which we use today are simply the old ones of the past.

It is surprising how difficult it often is to define a term which we use constantly and glibly. Static electricity is no exception. Probably most of us have confused the effects of static electricity with the actual thing itself. The word static is very definite, and the definition given to us in the dictionary is quite satisfactory. The dictionary defines the word static as pertaining to bodies or forces at rest. Therefore, static electricity is electricity at rest. But what of the word "electricity"? Our dictionary doesn't give a satisfactory answer and neither do our textbooks. Suppose we move back into the past in order to find out where the word electricity came from.

The First Observation of Static Electricity

Our story of static electricity is the story of all electricity for over 2,000 years. For it is only in comparatively recent times that electricity became "dynamic." To conjure up the names of all the men who helped to develop the science and all the ideas and discoveries which fill its history is impossible in our short space. We shall examine those discoveries which are the basic cornerstones in the development of the science of static electricity. We shall meet some of the men whose names are most closely connected with these discoveries. We shall neglect much — not because of the lack of interest but because of the lack of space.

The history of philosophy and science contains no earlier observation than that "yellow amber when rubbed has the power of attracting light bodies." Our history of static electricity thus starts with the very beginning of philosophy and science — with Thales of Miletus, the Father of Ionic philosophy, and with the oldest of resins, amber — the tears of the Heliades, the *elektron* of the Greeks.

Today we know that amber is a fossilized resin exuded millions of years ago from an extinct variety of pine tree. It is found widely distributed over the earth. To the ancients, however, amber was something more. It was highly valued as a gem and to it were attributed mysterious and occult powers. In fact, it was the most important gem known to the ancient world, and for ages was a powerful factor in the trade between widely separated peoples. Often in the past, Sicilian amber sold at a price far beyond the price of diamonds.

Opinions as to the origin of amber have been contradictory and conflicting, perhaps due to the fact that the Phoenicians, the earliest amber merchants, were not inclined to disclose to the Greeks the source of their valuable merchandise. While we find Theophrastus writing 300 years before Christ that "amber is a stone which is dug out of the earth of Liguria," the ancient Greeks gave more credit to the myth perpetrated by the Phoenicians that amber was the "tears of the Heliades." The Heliades were the poplar trees into which the three sisters of Phaëton had been transformed by Jupiter. They stood through all of time shedding tears of amber into the stream which flowed by their brother's tomb.

Just as obscure is the origin of the first observation of amber's attraction for particles of straw and chaff when rubbed. That this knowledge of amber's attractive power goes back to the dim past is seen in the very names given to amber, in the ancient languages. For example, in Syrian, amber is called Haparga, which means "attracting with force" or "clutching." In Persian, amber is called Karuba, this word signifying "capable of attracting straw."

It is to Thales, however, that the ancient historians, Aristotle and Plutarch, attributed the first electrical observation — the observation that amber when rubbed attracts bits of chaff and straw. Thales of Miletus lived about 600 years before Christ. He was the leader of the Ionic school of philosophy, before which there was no philosophy or science. Thales, in fact, has been called the Father of Science. Thales



GVLIELMI GILBERTI COLCESTRENsis, MEDICI LONDINENSIS.

DE MAGNETE, MAGNETICIS QVE CORPORIBVS, ET DE MAGNO MAGNETICO TELLURE; PHYSIOLOGIA NOVA, plurimis & argomentis, & experimentis demonstrata.



LONDINI
EXCVDEBAT PETRVS SHORT ANNO
MDC:



Otto Guericke

Sir William Gilbert, physician to Queen Elizabeth, investigator of electric and magnetic phenomena, and pioneer in establishing the age of science. Gilbert spent three decades in investigating electricity and magnetism.

*Title page of Gilbert's contribution to science, *On the Magnet, Magnetic Bodies, and the Great Magnet, the Earth*, published in 1600. When printed this volume was able to record all facts, then known, about magnetism.*

learned geometry in Egypt, and laid the foundations for the science of the geometry of lines. He was the first man to predict with accuracy an eclipse of the sun. He was a merchant, engineer, and astronomer.

Now, Thales only noted the attraction of amber for small particles of various materials and remarked upon it. He did not recognize that the particles also had an attraction for the amber. He did not recognize electrostatic repulsion and was ignorant of the fact that many other substances also had the power of attraction when rubbed. Nevertheless, by noting the electric attraction and theorizing about it and by calling it to the attention of others as something important and mysterious, Thales forged the first link in the great chain of scientific thought and investigation which reaches from the distant past to the present.^{*1,2}

Queen Elizabeth's Physician— the First Electrician

We now cross a span of some 2,000 years without finding anything significantly new in our story of electricity, until we arrive in England at the end of the Sixteenth Century, during the reign of Elizabeth—that strong and willful Queen under whose rule great literary masterpieces were written, frontiers in the new world were conquered, and the Spanish Armada destroyed. It was Queen Elizabeth's own personal physician, William Gilbert, who pointed out new frontiers in science, and because of his work in electricity is still known to us as the Father of Electricity.

Only a few facts are known about William Gilbert's life, and practically no relics remain. There are no contemporary portraits and no manuscripts. His one legacy to posterity however is his great book, *On the Magnet*, published in 1600, which contains the results

of his many years of work on magnetism and electricity. William Gilbert was born in Colchester in England in 1540, and died in London in 1603. Nothing is known of his boyhood. Possessing an M.D. from Cambridge, he was successful as a physician; had the highest respect of his fellow doctors, and was appointed personal physician to Queen Elizabeth whom he attended in her last illness.³ All that Gilbert wrote on electricity is interpolated in the second book of his volume *On the Magnet*. This short chapter however presented many new facts, many new ideas, and many new methods in electricity. In fact, it was the first scientific treatise on electricity.⁴

Prior to Gilbert only two electrical phenomena were known. These were the attraction of amber, after rubbing, for bits of chaff, and a similar property held by jet, a kind of hard coal. He submitted these phenomena to scientific experiments, and by means of an electroscope which he invented, disproved the idea that this magical property of attraction was possessed only by amber and jet.

He showed that, besides amber and jet, such substances as diamond, sapphire, sulfur, mastic, sealing wax, resins, and many other materials had this attractive power. He also pointed out that there were many substances, such as pearl, marble, gold, silver, copper, and iron which did not show the attractive power after rubbing. He gave the name of electrics to those substances which developed the attractive power after rubbing, and the name of anelectrics or non-electrics to those substances which did not. He showed that the attraction exercised by electrics was not limited to mere straw or chaff, but that all metals and woods, as well as stones and earth, were attracted. He was the first to find out that oil, water, and other liquids could be attracted by the electric force and he noted that moisture in the air, as well as on the surface of materials, affected their electrical properties. Fi-

* Please see numbered references at end of article, page 384.

nally, he showed that magnetic attraction and electrical attraction were completely different phenomena.

Peculiarly enough, however, while Gilbert relied upon experiment and did not readily accept the statements of the ancient writers, he did hold certain ideas concerning electrical attraction which were false. He insisted that electrical attraction was a one-sided, and not a mutual, force, and he denied the existence of electrical repulsion, although he clearly recognized magnetic attraction as mutual.⁵

It remained for another illustrious English scientist, Robert Boyle, some 75 years later, to carry on electrical studies in the tradition of William Gilbert. He made use of the latter's correct observations and corrected the few wrong ones. It was Robert Boyle who showed that electrical attractions were mutual and that this electrical attraction could exist in a vacuum — air being unnecessary for its propagation.⁶

The Static Generator Stimulates Further Interest in Electricity

In the advancement of any branch of physical science there comes a point where the advance slows until means are at hand for readily producing at will and in fair quantity that force which is being studied. This was no less true in the case of static electricity. For thousands of years this electric force could be made weakly manifest by rubbing amber in the hand, and later by rubbing glass with the hand or with fur. While the small amount of electricity produced in amber or glass was sufficient for determining some of the first principles of electricity, a greater quantity of this force was needed before many of the great principles of electrical science could be understood. Such phenomena as electrical repulsion, the development of an electric charge by induction, and many others

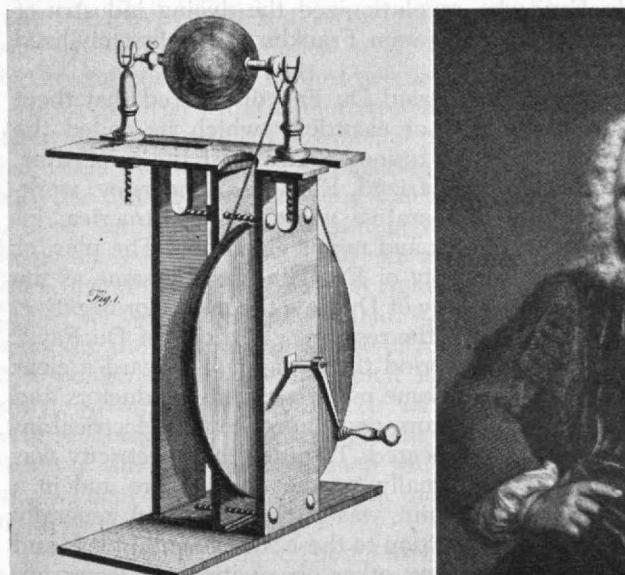
required a much greater electrical force to become unveiled.

Thus, the invention of the first machine for producing static electricity by Otto Von Guericke in the last half of the Seventeenth Century marked a milestone in electrical science. Von Guericke was a German physicist and the burgomaster of Magdeburg. He is equally well known for his invention of the air pump as well as for the experiment known to every school boy, of the Magdeburg hemispheres. It was Von Guericke who proved that light could pass through empty space and that sound required a medium, such as air, for propagation.¹ It is not surprising that when a man of Von Guericke's mental powers turned to electrical studies, he produced the static generator.

Von Guericke's machine was simple in conception and in operation. He simply mounted a sulfur globe on a spindle which was turned by a handle, and using his hand for a rubber, he drew sparks from the globe. In Von Guericke's words, the sulfur globe was "about the size of the head of an infant," and it was made by "pouring melted sulfur into a glass vial of spherical form which was broken after the sulfur had solidified."

With this machine Von Guericke made many observations and several were important contributions to electrical science. He clearly recognized the phenomenon of electrical repulsion as one day he chased a feather about his room with the electrified sulfur globe. On another occasion he recognized the principle of electrical induction or the electrification of neighboring bodies without actual contact, when a thread suspended near his sulfur globe became electrified without actual contact and was repelled as he brought his finger near.⁷

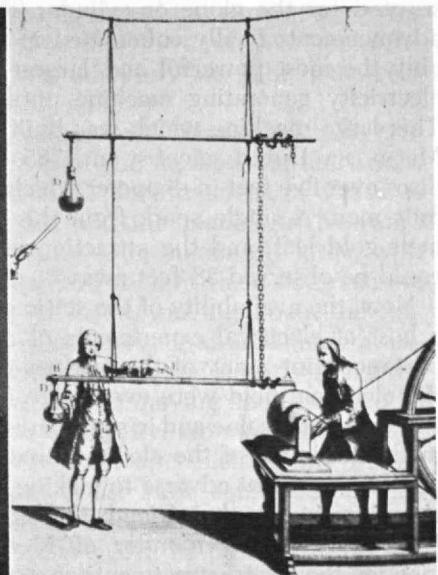
For almost a hundred years after the invention of Von Guericke's machine, improvements and changes



A Seventeenth-Century static generating machine of Hawksbee. The handle and crank affixed to the large disc were turned by hand to rotate the globe of sulfur or other insulating material, at the top. Frictional contact with the globe produced static electricity.



Pieter van Musschenbroek, of Leyden, built the first device for storing electricity, by filling a glass jar with water to which metallic contact was made. Ewald Georg von Kleist apparently made the same discovery at about the same time.



Eighteenth-Century book engraving showing the earliest experiment for charging Leyden jars, D. by means of the static generator, A. Ropes, supporting the jars, and shown at the top of the illustration, provided sufficient insulation to prevent discharge.

**EXPERIENCES
ET
OBSERVATIONS
SUR
L'ÉLECTRICITÉ**

FAITES
À PHILADELPHIE EN AMÉRIQUE
PAR

M. BENJAMIN FRANKLIN;
et communiquées dans plusieurs Lettres à M. P.
COLLINSON, de la Société Royale de Londres.

Traduites de l'Anglais.

SECONDE ÉDITION,

Nouvelles, corrigées & augmentées d'un supplément contenant
des expériences nouvelles.

Par M. D'ALIBARD.

TOME PREMIER.



A PARIS.

chez DURAND, rue du Foin, au Griffon.

M. DCC. LVI

Après Approbation & Privilège du Roi.



Title page of Benjamin Franklin's Experiments and Observations on Electricity, Made at Philadelphia, which book marked Franklin as an outstanding experimental investigator of his time, and enunciated the single fluid hypothesis of electricity.

Charles Augustin Coulomb, whose careful observations on the force between electrified bodies by means of a torsion balance enabled him to enunciate the inverse square law of force for charges — the first quantitative statement in electricity.

in the instrument were made by many others. About 1705 Sir Issac Newton replaced the sulfur globe with one of glass, and about 1733 Boze, a German, added metallic conductors which became an essential feature of all later machines. A few years later leather rubbing pads were substituted for the hand, thus enabling the operator to dispense with an assistant whose duty it was to place both hands upon the rotating globe or cylinder. Finally, glass discs were substituted for the globe or cylinder, and all of these advancements finally culminated in what was probably the most powerful and largest frictional static electricity generating machine until modern times. This large machine which was built by Martin Van Marum, a Dutch scientist in 1785, contained glass discs over five feet in diameter which were turned by four men. A single spark from this machine would melt gold leaf, and the attraction of a linen thread could be observed 38 feet away.⁸

Now, the availability of the static generators led to a host of electrical experiments of considerable importance. But many of the workers of this period in the electrical field were even more interested in the entertainment value and in some cases in the supposed medicinal value of the electric force. Many of these workers were not adverse to making use of the static generator to give their friends the "hot seat" and even John Wesley, the founder of Methodism, recommended the electric treatments as a cure for hundreds of diseases and ailments.⁹

The Electric Force Is Stored — The Leyden Jar

Progress in electricity during the early part of the Eighteenth Century continued to be made. This progress was made by a small group of men living in

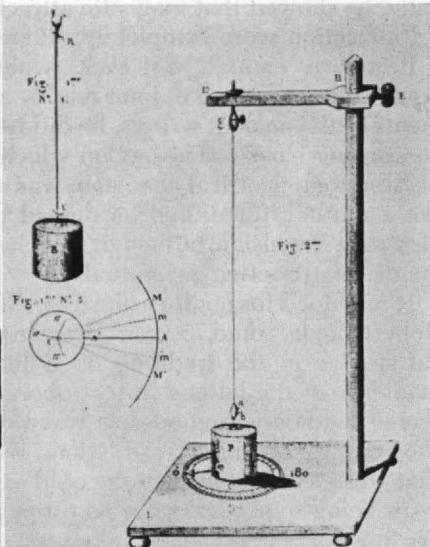


Diagram of torsion balance of the type used by Coulomb in making his investigations on the forces between electric charges and, later, on magnetized bodies. With such simple apparatus, Coulomb derived the inverse square law of force for electric charges.

Europe and even in America. Each of these men was as diverse in nature and in position as it is possible to conceive. In those days science was not the day-to-day business of professional scientists as we know it today, but the hobby or avocation of physicians, ministers, librarians, and sometimes even merchants. Among those who made important discoveries in electricity during the early part of the Eighteenth Century, two names are particularly well known to us: Charles F. du Fay, who revolutionized the dyeing industry of France, and Benjamin Franklin — "the first civilized American."

During this period Du Fay discovered that there were two kinds of electricity which he called the vitreous and the resinous. At almost the same time, Franklin and his friend, Ebenezer Kinnersley, working in the comparative wilderness of America, invented their plus and minus electricity. The plus, or positive, electricity of Franklin was the same as the vitreous electricity of Du Fay; the minus, or negative, electricity being the resinous electricity of Du Fay.¹⁰

During this period there was put forward a clear conception that some materials were conductors and some nonconductors, and the concept of electrical insulation also appeared. The idea that electricity was normally, uniformly, present everywhere and in a state of equilibrium, was put forward and generally accepted. In addition to these fundamental ideas and observations, many other observations of lesser importance were made, and many wild theories came forth to be discussed, argued about, and then forgotten.

Now, as we have mentioned above, the invention of the static electricity generating machine had served to give a real push to the study of electricity, and as (Continued on page 376)

Operations Research

— AN APPLICATION OF SCIENTIFIC METHOD

***It Provides an Opportunity for Scientists and
Engineers to Reach Wise Decisions on Problems
Affecting a Wide Range of Human Activities***

By PHILIP M. MORSE

HERE has been a great deal of discussion recently about the scientific method and the importance of applying it to human problems in general. To the extent that the definition of the scientific method is broadened to mean the unemotional and systematic study of some field of knowledge, these discussions come close to a long-winded way of saying "let's be calm, boys." It is, of course, uplifting to think of the method of science as being so broad that obviously any subject comes within its scope; but the danger is that the word "science" and its connotations then become so diluted as to lose all flavor and meaning.

The writer, personally, would rather see the phrase "scientific method" have a more restricted meaning. This stand, of course, also has its difficulties. It implies, for example, that the scientific method may not be a universal panacea, that it may indeed not be applicable to all human problems. In fact, if one tries to make restrictive definitions, one runs the risk of coming to the conclusion that there are several different kinds of scientific method, each developed for the study of a specific group of phenomena. Certainly this more restrictive course is more difficult to uphold consistently, but it is more modest in its claims, and scientists are supposed to be modest people, after all.

However, even with the more restrictive definitions of scientific method, it is possible, at present, to show that these methods have application and utility in fields far distant from those for which they were developed. Rather than being content with saying that this is obvious, the author will cite a few examples, and to avoid generalities will get right down to cases. The writer would like to document, with some simple examples, the specific application of scientific method to administrative problems which has come to be called operations research. It is an example of a healthy, grass-roots broadening of the range of application of the methods of science which one can discuss without having to indulge in unscientific boasts or overhopeful claims.

The research technique chosen as an illustration of the increased compass of science is the combination of quantitative hypothesis, controlled experiment and observation which is typical of a great deal of research in physics. It is a quite specialized technique, rather difficult to describe. Its essential elements involve the development of an extremely simplified, *but quantitative*, model of the phenomenon studied and the testing of the model by quantitative observation and

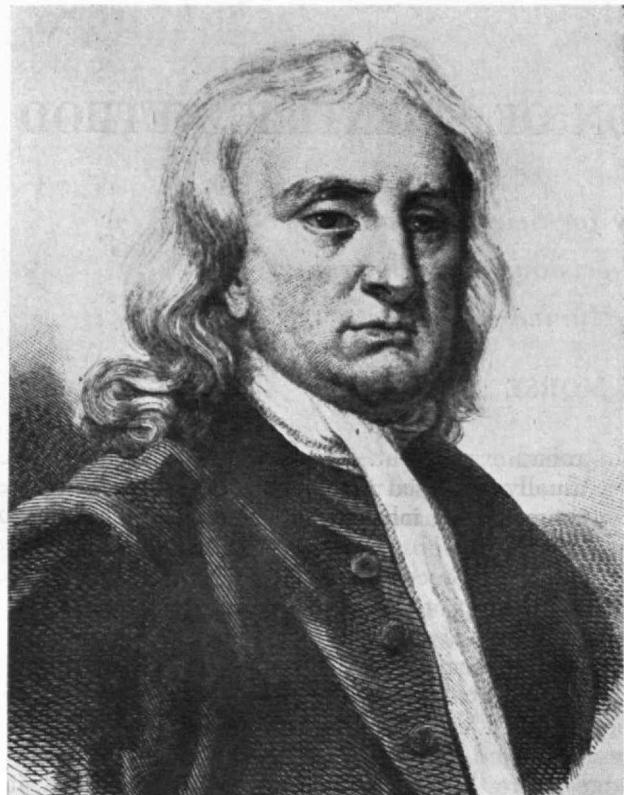
controlled experiment. The details of the model are usually expressed in mathematical language and the consequences inherent in the model, which are to be checked by observation, are usually derived by mathematical procedures.

Some may protest that the technique described is *the* technique of *all* science, that until a field of study can use these mathematical-experimental methods it shouldn't be called a science. This may be so, but I personally doubt it. There are a number of fields of research, and there are vast areas of human knowledge where the method cannot be used at present; it may never be applicable in much of this area. That it is applicable in some areas where it has not been used heretofore is interesting and heartening; but this is far from proving that it is applicable everywhere.

In fact, when you look at the technique closely and then look at the bewildering complexity of the world around us, you will find it astonishing that the procedure ever does succeed. How is it possible, from the jungle of facts surrounding some phenomenon, to abstract a few and from them to build mathematical theories which have any validity at all? How can a model, which represents a world as a point mass, for example, or the sun's rays as wave propagation in the ether, enable one to predict anything about the real world or about actual radiation?

Let me take an example which is fairly familiar, to show the peculiarities of the method, its limitations as well as its power. Think, for a moment, of what was known about the sun and the planets in Newton's time. Here was a central sun, immensely large, with planets moving around it; each of them large masses of matter, rotating, as well as moving, about the sun. Most of them had moons moving around them in extremely complicated paths. On the surface of at least one, the earth, were objects moving about, tied to its surface by the force of gravity. How could a simple, mathematical model be set up which would predict these complicated motions? How could we abstract from this bewildering detail the few essential elements of the motion? Would it be possible to neglect everything else and understand this part by itself?

Newton was, of course, aware of the mass of accurate observations made by Tycho Brahe on the motions of the planets. He knew that Kepler had reduced this mass to a set of empirical laws of motion: that a planet's path was approximately that of an ellipse, with the sun at one focus, that the path of the moon relative to the earth was also an ellipse with



Keystone View Company

Sir Isaac Newton

—developed a mathematical model of the planetary system tied in with the force of gravity at the earth's surface, with integral calculus as a by-product.

the earth's center at a focus, and so on. These empirical laws enabled one to calculate, to predict, to foretell eclipses and planetary positions. But they were not yet science, as we know it now; we had not yet reached an understanding of the phenomenon. The next step is the essence of the method I am describing, the hardest step of the whole sequence, the matching of the data to a mathematical concept or pattern. Newton had to get a pattern out of the data, not to force a preconceived pattern on the data; the difference is subtle but all-important.

Newton's first contribution was the concept of a force acting between the planets. To make it quantitative he had to express the consequences mathematically, and to do this he had to devise the language of differential calculus. He then could show that if, for example, the earth and moon were both mass points and if they were attracted by an inverse-square force, then the point representing the moon would actually move in an elliptic path as required by Kepler's laws. Moreover, he could show that the amount of force required to make the mass-point moon travel the way the actual moon travels also "explained" the force of gravity on the surface of the earth. To be more explicit, he found that if he computed the magnitude of the inverse-square force at a distance from a point-earth equal to the actual earth's radius, then the force came out roughly equal to that actually acting on bodies at the earth's surface. The check was not too good at first because his early data on the earth's size were not very good; when better survey

data were used, the check was quite satisfactory. He then had a mathematical model of the planetary system which duplicated Kepler's laws and at the same time tied in with the force of gravity at the earth's surface.

But at what a sacrifice of detail! He had point masses instead of planets. Perhaps Saturn might seem a point mass to the sun and vice versa, but was the earth a point mass to a man on its surface, or even to the moon? This oversimplification bothered and discouraged Newton so much that he delayed publication of his theory until he could clear it up. He had to substitute for the inverse-square force between point masses the idea of an inverse-square attraction between each portion of mass in the universe, and then had to show that a sphere of such attracting matter had the same attraction for a mass outside it (or even on its surface) as if it were a mass point. This he finally was able to show, though he had to invent integral calculus to do it.

Newton's achievement is, of course, the classical example of the power of the technique the writer has been describing. It is also a good example of its limitations. We say glibly that Newton's law of gravitation "explains" the motion of the planets and of gravity on earth. But by the word "explain" we merely mean we have referred all these phenomena to the same simplified mathematical model; we do not mean we have related it all to some philosophic or religious first principle. The "explanation," or the mathematical model, or whatever you want to call it, is of active value, however, for we can elaborate it, to make it correspond more closely to the real world, and we can use it to predict other phenomena. We can employ its machinery in new situations also; it helped considerably to get us started in our understanding of the atom, for example.

We can use the theory in much more useful and fundamental ways than we could use the empirical formulas of Kepler. For example, if the data does not exactly correspond to the formula, we can often work out what is wrong. When the orbit of Uranus did not fit the formulas, it was possible to work out that another planet was causing the deflections and thereby to predict the location of Neptune. When the orbit of Mercury did not fit, on the other hand, it needed a new theory of gravitation, general relativity, to "explain" the discrepancy. Some of the most searching investigations of all, leading to yet deeper understanding of nature, have come through investigating real or apparent discrepancies between theory and observation.

But it is not obvious that the technique of specialized mathematical theory tied to selected experimental measurements will be capable of unraveling the whole of the universe around us. Darwin's theory of evolution, for example, is not in the same pattern; it does not have the quantitative mathematical element. And yet the theory of evolution has had as great an effect on biology as gravitational theory has had on physics. It is not at all certain that the facts and concepts of comparative embryology, for instance, can ever be expressed mathematically or that the political behavior of a nation can be represented by a set of equations. It may very well be that the tech-

nique of physical science is useful in understanding only a fraction of the multifold aspects of nature.

But the areas where the quantitative model technique works do cover a wide range of phenomena. Random events, for example, can be handled by the mathematics of probability and statistics. A statistical model of a gas may be just as quantitative as a purely mechanistic one and at the same time be considerably simpler.

And the areas where the technique is appropriate extend well beyond the limits of what is called physical science. The modern science of genetics is certainly an example of the successful application of a very simple mathematical model to an immensely complicated subject. Mendel disregarded all the details of plant and seed growth and concentrated on a few unimportant properties of the plant he was studying, such as the color of its blossoms. By studying the regularities of the dependence of blossom color in various generations, he was able to evolve the concept of dominant and recessive genes in the egg and sperm, and to formulate the statistical laws governing the inheritance of unit characters.

It does not matter that only a few properties of living things are unit characters; it does not matter that the actual nature of the gene, its mechanical behavior during cell division, the chemical means whereby it impresses its properties on the next generation, that all these are still virtually unknown. In spite of this, Mendel's theory has enabled us to "understand" genetics, has enabled us to predict the outcome of interbreeding, has enabled us practically to design a plant or an animal to fit particular needs. Some of the more recent books on population genetics are nearly as mathematical as books on atomic physics and nearly as hard for nonspecialists to understand. Here then is a mathematical model of very great utility, in a field outside physical science.

Since World War II, the application of this technique of exploration has spread still further. The newly developing field of communications theory is a good example. Surely the process of transmission of ideas from one person to another, involving as it does philology, phonology, cryptology and paleography, is about as far afield from physical science as can be, yet it turns out that there are many aspects which can be studied quantitatively and by the use of mathematical analysis. As yet, the theory is in its infancy and the correspondence between the simple theory and reality is only fragmentary. But already the simple concepts are clarifying our understanding of the field, and one can expect valuable applications to be forthcoming.

The Outline of Patterns

Perhaps you can see the general trend of my discussion by now. The increasing use of machinery has channeled many of our actions into patterns which can be studied by the techniques of physical science or has suggested ways whereby some of our actions, even without machines, can be described in a quantitative manner. It is important and useful to set up adequate mathematical models for these patterns of action and to carry out the necessary experimental

observations to verify the models. Such basic research will enable us to "understand" the various actions, in the sense that physical science uses the word "understand." It is not necessary that we fully comprehend the psychology or physiology basic to the action. As long as the quantitative regularity is present, we can set up and use the mathematical model. These theories can then be used in various applied sciences, which are already in the process of developing.

For example, as machines get more complicated, we need to know how one part interacts with another and how the human operator interacts with the machine. The applied science dealing with the over-all behavior of machines and their human operators is known as systems engineering. It was first developed in the telephone industry when it was found that the design methods used to put together a working automatic exchange were not the same as those used to put together one of the component relays. Today many industries employ systems engineers to ensure that the sum of all the parts of a complex machine equals a working whole. Many of the tough problems tackled by the systems engineer are those connected with complicated feed-back circuits; some part of the output energy is returned to the input, which may cause uncontrolled oscillations or otherwise may distort the action. Many machines are hard to learn to operate; by modifying various feedbacks, the systems engineer can make the machine better fitted to the human operator.

Analysis of Actions

But the applications of the method are spreading beyond machine design. In most large industries, in many activities of government, in some military operations, there are actions of men and machines which can be analyzed to some extent by the technique of mathematical model plus experiment, and the increased understanding resulting from this analysis will enable the director or officer in charge of the operation to run it more efficiently. The applied science which uses the techniques we have been discussing to help the industrial, governmental, or military administrator run the operations under his control more effectively is coming to be called *operations research*. In the rest of my article, I will outline a few of the mathematical models which have been used in operations research, to show how this model technique still works in fields far removed from physics and chemistry. The examples will sound rather trivial compared with the broad sweep of celestial mechanics and communication theory which were touched on earlier. But perhaps a few simple, everyday cases, however trivial, will be easier to work out in detail, so that the reader may see the basic concepts and method.

Take the simple business of waiting in line, the British call it queueing. All of us do it too much of the time; if we drive to work in the morning we wait at traffic lights; if we go to a cafeteria at noon we wait for our lunch. It is the headache of many businesses; it is a vital problem for air lines when an airport clouds in, and the airplanes begin to stack up, waiting to land. Let us see what we can say about this sort of a problem.

We start as usual, with a fantastically simplified case; one where the front of the line is served at some constant rate, say S per second, and where the rear of the line is being filled up by people (or airplanes) coming in at random times but with an average rate of arrival A per second. We will also assume that this has been going on long enough so that a steady state has been reached; we can consider the transient case as a later elaboration. The key to this mathematical model lies in the working out of the various probabilities that the line will have zero, one, two, or n persons in it. Call the probability that there are n persons in the line P_n .

If P_n is large, for example P_{10} , this means that we are quite likely to find 10 people ahead of us when we arrive in line; what the restaurant tries to do is to make P_0 large.

To have a steady state none of the P 's should change with time. But every time a person arrives all the P 's step up by one, P_0 changes to P_1 and so on, and every time a person is served they all change downward. So, in order that A persons arriving a second and S being served a second will not continually change the probabilities, they must be related in some special way. For example, the rate of disappearance of a line of zero length is AP_0 , the rate of arrival times the chance that a zero-length line is there; the rate of appearance of a line of zero length is SP_1 , the rate of serving times the chance that a single-length line is present. To have a constant probability of zero-length line, we must have these two rates balance:

$$AP_0 = SP_1$$

Similar balance for lines of unit length, of length n and so on, gives rise to the sequence of equations:

$$AP_0 + SP_2 = (A + S)P_1;$$

$$AP_{n-1} + SP_{n+1} = (A + S)P_n$$

and so on. These can be solved, giving:

$$P_n = (S-A)(A^n/S^{n+1})$$

as long as the rate of serving, S , is larger than the rate of customer arrival, A . It is obvious that if customers are arriving at a rate faster than they can be served, the line *cannot ever* be stationary in length and, if they value their reputation or peace of mind, our restaurant or airport managers must avoid this at all costs. But even when customers arrive more slowly than they can be served, we see that there is a finite chance that a line will form. In fact, the average length of the line turns out to be:

$$A/(S-A)$$

This quantity is quite small as long as the maximum serving rate S is at least twice the arrival rate A . But if people arrive nearly as fast as they can be served, the average waiting line rapidly lengthens: if A is 0.8 S , then the average number in line is 4, if A is 0.9 S , the line has 9 in it, on the average, and so on. For example, if A is 0.8 S , if customers are served 25 per cent faster than they arrive, on the average,

then 20 per cent of the time there will be no line, 16 per cent of the time one will be waiting, 13 per cent of the time two will be in line, 8 per cent of the time four will be waiting, 2 per cent of the time ten will be in line, and so on; the average line length will be four.

It may seem peculiar that there should be any waiting line when the mean rate of service is greater than the average rate of arrival: this is due to our assumption of randomness in service and arrival. We assume that each customer doesn't conveniently arrive just when the last customer has been served. The customers arrive at random, which does not mean regularly. Also one customer may take longer to be served than the next and a bunch of customers every now and then arrive just when a slow-poke is being served. These random mismatches between customer and server do not matter much if the service is considerably faster than the average rate of arrival; once in a long time two or three may come in a bunch, but most of the time no one is waiting. But if customers arrive nearly as fast as the line can be handled, these mismatches occur more and more often and the chance of a long line occurring quickly is large. Of course, if the servicing process could be made absolutely regular, each service completed exactly in 10 seconds, for example, and if also we could regiment our customers to arrive exactly 10 seconds apart, so that one walked in the door exactly at the end of each 10 seconds, then S could *equal* A and still no line would form.

But service is very seldom as perfectly timed as this, and we practically never can regiment the arrivals. Customers, automobiles, and airplanes do arrive in a random manner at restaurants, street intersections, and airports, and it turns out that the results of our simple quantitative reasoning fit actuality remarkably well in spite of our preconceptions to the contrary. Here is a case where theory and actuality contradict our intuitive feelings. In every case where this theory applies gross errors of estimate have been made, regarding the expected length of waiting lines, on the basis of non-mathematical hunches. Often long arguments have occurred before the managers would be willing to face the consequences of the theory. They would continue to say, "But why should there be a waiting line when I can serve them faster than they are coming?" in spite of the line which was there before their eyes. The results of such irrational behavior only produce irritation in the case of restaurants, gasoline stations, and the like; it is much more serious in the case of airports or docking facilities in harbors, particularly under wartime conditions.

Expansion of Theory

The simple theory, sketched so quickly above, can be expanded and complicated almost indefinitely. For example, the problem of machine maintenance in a factory is of this sort; the machine can be said to "arrive in the waiting line" when it breaks down, it is "served" when it gets repaired. The flow of parts through an assembly line is another example. The theory can tell us how many parts must be kept on hand

at each stage of the process, in order that no machine should be kept idle by delay in the earlier processing, for example. Many aspects of the over-all problem of industrial inventories also can be analyzed by this technique. Here it is the sales, the outflow, which has the large fluctuations; we need to balance between the requirement that orders be filled as soon as they come in, and the added and unwanted expense of operating a factory overtime if our inventory becomes depleted.

Another kind of problem, for which a model can be built, came up first in naval operations research, but has numerous business analogues. It concerns the operation of *search* for an enemy vessel, or submarine, or aircraft. The enemy is somewhere in a given area of the sea. How do you deploy your aircraft to find him? The central idea here is the *rate of search*. A single airplane can see the enemy vessel (by radar or sonar or visually as the case may be) R miles away, on the average. The airplane can "sweep out" a band of width $2R$ as it moves along; the picture is analogous to a vacuum cleaner, of width $2R$, sweeping over the ocean at a rate equal to the speed of the airplane and picking up whatever comes beneath it. An area equal to the speed of the airplane times twice the mean range of detection will thus be swept in an hour. The sweep rates of airplanes vary from a few hundred square miles per hour to several thousand square miles per hour, depending on the airplane, the radar equipment, and the vessel searched for.

If the enemy is equally likely to be anywhere within a certain area then the problem is a straightforward, geometrical one. The search effort is evenly laid out over as much of the area as one has airplanes available. The problem is a little complicated by the fact that detection is not certain at extreme ranges, so the probability of detection falls off near the edge of the swept band, and there should be a certain amount of overlap between bands to improve the chance of detection near the edges.

But if the chance that the enemy is present varies from area to area, the problem becomes quite difficult, nonmathematical intuition may lead to quite erroneous use of available effort. For example, if the enemy is twice as likely to be in one area than in another, then, if only a small amount of search effort is possible, all this effort should be spent in searching the more likely area; if more effort is available, some time can be spent on the less likely area and so on. A definite formula can be worked out in each specific case. Search plans for various contingencies were worked out by the operations research team attached to the Navy during World War II; they materially aided the naval efforts in many cases — by the application of the principles of operations research.

It seems a far cry from airplanes and ships and submarines to industry and business activities. But the utility of the mathematical models is their wide range of applicability. One possible business application of search theory comes in the problem of assignment of sales effort. Suppose a business has a limited number of salesmen, who are to cover a wide variety of dealers. Some of these dealers are large stores, which will usually produce large orders when visited, some are small stores with correspondingly smaller sales return.



A. Devaney, Inc., N. Y.

How should one employ aircraft most effectively for searching operations? A satisfactory answer is provided by the techniques of operations research.

If there are enough salesmen, every dealer can be visited every month and the optimum number of sales can be made, although the sales cost will be high. With fewer salesmen available, search theory indicates that the larger stores should be visited more often than the small stores; with very few salesmen it may be that only the large stores should be visited. If the probable return per visit for each store is known, the optimum distribution of sales effort can then be calculated.

An interesting and typical variation on this problem comes when we consider the action of the individual salesmen, when we try to make their behavior conform to the best over-all distribution for the company. For each individual salesman, with his limited effort, it may be best *for him* to visit only the large stores; if his visits are uncontrolled and if he is paid a flat commission, it may turn out that the large stores are visited too often, the small stores too seldom, for best returns *for the company as a whole*. It then becomes necessary to work out a system of incentive commissions designed to induce the salesmen to spread their efforts more evenly between large and small customers. If the general theory has been worked out, this additional complication can be added without too much difficulty.

This problem of balancing the tendencies of different parts of a large organization is one which is often encountered in industrial operations research. The sales force is out to increase sales of all items, though some items may return less profit than others; production resists change-over to making another product, though sales on the other product are increasing; and the financial department frowns on building up large inventories, though small inventories always put the production division at the mercy of sales fluctuations.

(Continued on page 390)

M.I.T. Has New Sailing Fleet

Fast, Strong, Durable, and Tough Are the 40 Dinghies with Glass Bottoms That Make Up Technology's Present Fleet

By WALTER C. WOOD

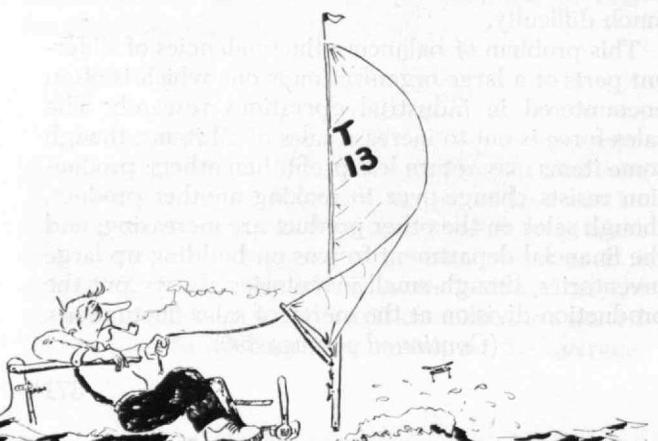
WITH its racks filled with 40 new Fiberglas hulls, finished in Technology gray with broad cardinal water line and contrasting dark gray deck, the M.I.T. Sailing Pavilion has taken on a new and refreshed look. An atmosphere of impatient anticipation also permeates the Sailing Pavilion, for not since 1936—when the Institute acquired its original fleet of 35 wooden dinghies and took the lead in fostering collegiate sailing—have Technology skippers so anxiously awaited the coming of the sailing season.

The original wooden fleet of Herreshoff-built dinghies, which have formed the nucleus of the Technology fleet for the past 17 years, have been replaced by sleek new creations which, like their predecessors, are the creation of Professor Emeritus George Owen, '94, and have been built by the Beetle Boat Company of New Bedford. First of the new hulls was exhibited at M.I.T. on Alumni Day, 1952, and was launched on June 11, 1952.[°] But the new Fiberglas hulls had their first real test on the Charles River Basin during the New England Collegiate Team Race Championship on November 8. This was the first large regatta to be held in winds strong enough to test the new fleet, shortly after the first dozen boats were delivered in the fall of 1952.

The early heats of the championship (which were sailed in match race fashion in pairs of colleges, with four crews selected from each of the eight leading New England colleges) were sailed with strong northerly winds of 20 miles per hour. As the races progressed through the second day and the following

[°] See "Athletic High Lights," The Technology Review, 54:503 (July, 1952).

A poster, designed by John R. Paulling, Jr., '52, inviting students to attend Shore School, shows how it feels to sail the new glass boats.



week end, the wind moderated, so that contestants had good opportunity to test the new boats under all sailing conditions.

As they came ashore after their first exciting race in the glass bottoms, Technology skippers concisely and exuberantly summed up their reaction to the new boats with the words, "Boy! They're terrific!" The new boat has received such universal approval that its design has been adopted by many colleges throughout the Midwest and along the eastern seaboard. Boats of the new design have been purchased by the sailing clubs at De Pauw, New Hampshire, Ohio State, Purdue, Rochester, Wesleyan, and Yale universities, as well as at Stevens Institute of Technology, Rensselaer Polytechnic Institute, and Webb Institute of Naval Architecture. It is hoped that the new design will be universally adopted for college use.

Alumni of the sailing program at M.I.T. will quickly recognize a great similarity between the lines of the old and the new boats, for the only departure has been to soften the lines of the stern, lower the freeboard slightly, and to round the bow at the deck to facilitate Fiberglas construction.

The new craft have a definitely sleek, smooth, modern look. While increased speed was not a primary objective of the new design, all concerned are pleased that the boats are faster than their predecessors and have shown a liveliness usually found only in less stable racing craft.

In the process by which the new boats are made† in a female mold, the boats are really painted before they are built. Permanent pigment colors are incorporated into the surface coating which is applied as a thick paste or paint to the inside of the mold. The strength-giving Fiberglas plastic laminates are then laid up in the mold on top of this paint surface bonding with it into a homogeneous hull. Only the cardinal water line has been subsequently applied as a paint. The Fiberglas construction provides a hull which is tough and strong, free from the ribbing of wooden boats, and easily and quickly repaired. As a result, the annual cost of maintenance should be considerably reduced from that required for wooden hulls.

While not a yachting enthusiast himself, Professor Erwin H. Schell, '12, in charge of the Course in Business and Engineering Administration, whose vision and initiative sparked the creation of the original Pa-

[†] See "Plastic Boats," The Technology Review, 54:232 (March, 1952).

One of the new Fiberglas boats photographed on the Charles River in the first Regatta on November 8. The Hayden Library and academic buildings of the Institute may be seen in the background.

vilion and fleet in 1935, has continued his interest again by leading the program to refurbish the Sailing Pavilion. Many of his old friends, whose names graced the gift plates on the original fleet have repeated their support on the new, but the names of the new boats have often been changed. Instead of the distinctly technical names given to many of the older dinghies, the interests and desires of the new donors are reflected in the names of the new boats. Prominent among the new fleet is the name *Dervish*, commemorating the favorite yacht of the late Henry A. Morss, '93, whose enthusiasm for the sport of sailing and wide acquaintance among yachting Alumni assured the success of the original program. While he died before he could see his plans completed, his name will always be remembered as one of the founders of the Nautical Association. We are proud to include in the new fleet the name of the last America's Cup defender *Ranger*, a gift of Harold S. Vanderbilt. As a companion boat on a nearby rack in the Pavilion is the *Shamrock*, given by Robert B. Smallwood in memory of Sir Thomas Lipton whose many challenges for the "Old Mug" did so much to forge the bonds of friendship between yachtsmen of the old and the new world. The name *America* also appears as a reminder that the famous old yacht (which started yachting in the new world in 1851 by her trip to England and exploits off the Isle of Wight) was once the flagship of the M.I.T. Yacht Club in the era between 1890 and 1900, when many eastern colleges boasted yacht clubs.

Other names which will awaken familiar or nostalgic remembrances among yachtsmen are Pierre S. du Pont's ['90] *Barlovento*, winner of many offshore races, Alfred L. Loomis' *Northern Light*, frequent winner of New York Yacht Club cruising runs, and *Astrea*, a gift of Richard L. Bowditch, '23, commemorating the name



M.I.T. Photo

of the ship on which his famous ancestor, Nathaniel Bowditch, worked out his navigation tables. Favorite names from the old fleet which are repeated on the sterns of the new are James F. McElwain's ['97] *Shooting Star*, William Emerson's [Professor Emeritus of Architecture] *Architect*, and Henry E. Warren's ['94] *Telechron*. In commemoration of the designations carried on one of his first and most successful racing craft, Professor Owen selected the name *Whirl* with the sail number 37 for his boat.

Already, as weather permits, the new hulls are appearing in increasing numbers on the Charles River Basin and the coming season promises to be one of the most interesting in the Institute's sailing history. But the acquisition of as exciting and stimulating an extra-curricular facility as the new dinghy fleet should not be without appropriate celebration. Accordingly, Saturday, May 9, has been set aside as a gala day on which to dedicate the new fleet in suitable ceremonies at the Institute's Sailing Pavilion. It is hoped that many who have supported the sailing program will be able to attend the dedication of the new boats and participate in the sailing. Included in the full day's program are sailing races for visiting Alumni, and a banquet at the Faculty Club in the evening.

THE INSTITUTE GAZETTE

PREPARED IN COLLABORATION WITH THE TECHNOLOGY NEWS SERVICE

Council's 295th Meeting

EDWIN D. RYER, '20, President of the Alumni Association, opened the 295th meeting of the Alumni Council at 7:30 P.M. on Monday, March 30. As usual, the meeting was held at the Faculty Club, Sloan Building, and 133 members and guests attended. Speakers for the evening were M. Stanley Livingston, Associate Professor of Physics, and Professor Edwin R. Gilliland, '33, Acting Head of the Department of Chemical Engineering.

As items of business, Donald P. Severance, '38, Secretary, reported that two Alumni had requested changes of class affiliation, and that 15 members of the Institute's staff had visited eight M.I.T. Clubs between March 11 and March 30.

The appointment of chairmen of subcommittees for Alumni Day, on June 15, was announced as follows: *Banquet*: Donald W. Kitchin, '19; *Departmental*

Reunions: Carl F. Floe, '35; *Ladies*: Mrs. John B. Wilbur; *Luncheon*: E. P. Brooks, '17; *Registration*: Wolcott A. Hokanson, Staff; *Transportation and Parking*: Emmons J. Whitcomb, '11.

On February 20, the first meeting of the M.I.T. Club of New Mexico was held in Albuquerque. Recognition of this new club — which brings the number of local associations up to 90 — was voted by the Executive Committee in its afternoon deliberations, and also by the Alumni Council on the evening of March 30.

For the Alumni Fund, Henry B. Kane, '24, Director, reported that as of the end of March, 8,678 Alumni have contributed \$168,000 for the current year. These figures represent gains of 32 per cent in contributors and 44 per cent in amount.

"Billion Volt Accelerators" by Professor Livingston was the subject of the first address of the evening. The importance of particle accelerators, or atom smashers, for studying the nature of atomic nuclei was outlined by Dr. Livingston, who illustrated the tremendous strides which have been taken in the construction of such accelerators over the past 25 years. On the average, every six years the maximum energy of particle accelerators has increased by a factor of 10. The first range of exploration of nuclear forces can be handled by particles of a few million electron volts. The next range of investigation involves the production of mesons, those short-lived particles observed in cosmic rays which are intermediate in mass between protons and electrons. For these investigations instruments of a few hundred million electron volts are necessary. Accelerators producing beams of particles of several billion volts energy are required to produce and study the property of mesons. The Cosmotron at Brookhaven National Laboratory is the first accelerator to exceed one billion volts, and was put into operation during the past year. It produces a world's record energy of 2.3 billion volts. Using a new focusing principle, accelerators are now being planned for the 10- to 100-billion volt range.

Professor Livingston worked on the first cyclotron with Ernest O. Lawrence of California Institute of Technology, and also took part in the design of the new Brookhaven Cosmotron. He is now director of an M.I.T.-Harvard group currently designing a pilot accelerator of 15 billion electron volts. Such particle accelerators, Professor Livingston remarked, represent a sizable financial burden on colleges and universities for the tools of research are no longer the simple devices which sufficed to the beginning of the Twentieth Century.

In presenting the second talk of the evening, Professor Gilliland made clear the need for the reclaiming of brackish and salt waters to augment the limited supplies of fresh water in arid sections of this country.



M.I.T. Photo

Gracing the entrance of the Institute's School of Industrial Management is this oil portrait of Alfred P. Sloan, Jr., '95, painted by A. Jonniaux on commission from Karl T. Compton, chairman of the Corporation.

Arthur B. Cram, '80, oldest living Alumnus of the Institute, celebrated his 100th birthday anniversary on March 13. In celebration of this auspicious occasion, members of the M.I.T. Detroit Association visited Mr. Cram at his home, 261 West Ten Mile Road, Royal Oak, Mich., and presented him with letters of congratulation from Karl T. Compton, Chairman of the M.I.T. Corporation, James R. Killian, Jr., '26, President of M.I.T., and Edwin D. Ryer, '20, President of the Alumni Association, who were happy to honor Mr. Cram at the gathering to celebrate his centennial.

Those attending the centennial presentation are (in reading order): David M. Sutter, '26, Past President, Adam K. Stricker, Jr., '29, President, Everett V. Martin, '24, Treasurer, Miss Cram, John M. Campbell, '25, Secretary of the Detroit M.I.T. Association, and Arthur B. Cram, 80, seated. Mr. Cram received a diploma in general science from Pennsylvania State College in 1870 and is the oldest Alumnus of that institution as well as of M.I.T. where he studied architecture. Mr. Cram opened his architectural office in Detroit in 1881, and retired from his career as architectural engineer in 1935 at the sprightly age of 82. Many of Detroit's older homes are evidence of Mr. Cram's architectural ability.



General Motors Research Laboratory

and other parts of the world. He summarized the various practical means for recovering fresh water from salt water, gave the comparative costs of such reclamation, and indicated the commercial feasibility of the various systems.

Widely used steam distillation methods are expensive, costing from \$1.00 to \$1.50 per thousand gallons. In terms of irrigation, this amounts to \$400 per acre for a three-months' growing season. The cost of such water purification is entirely out of the question economically. Vapor compression, also widely used, costs approximately \$1.00 per thousand gallons. Ion exchange methods, which are satisfactory for water with reasonably low salt content, can produce fresh water at a cost of \$0.50 per thousand gallons from brackish waters containing from 1,000 to 5,000 parts of salt per million parts of water. This method is not economical for purification of sea water.

A new method is being developed involving ion-selective membranes, which permit passage only of the ions comprising sea water. Since electrostatic forces are responsible for the demineralization, only electric power is consumed. Present indications are that power requirements will be approximately 30 kilowatt-hours of electricity per 1,000 gallons of water. Including the cost of amortization of equipment, it is estimated therefore that sea water can be demineralized with present units at a cost of approximately \$0.50 per thousand gallons. Improvements now under development may reduce cost to about \$0.30 to \$0.40 per thousand gallons. With brackish water, such as incurred in arid lands, the cost of demineralization by ion-selective membranes may be lowered to \$0.15 per thousand gallons for a corresponding irrigation cost of \$50 per acre for the growing season, which is not exorbitant for high-priced crops.

Regatta on Potomac River

CREWMEN from M.I.T. will take part in the Eighth Annual Championship Regatta of the Eastern Association of Rowing Colleges on Saturday, May 16. The regatta, the largest ever staged in America and the major event of the sprint rowing season of Eastern Colleges, will bring together in Washington, D.C., the top-notch varsity, junior varsity, and freshman crews to determine the 1953 champions. Presentation of the trophies will be made at the White House, immediately after the races, by President Eisenhower.

A total of 32 crews will participate in the races, representing Boston University, Columbia University, Cornell University, Dartmouth College, Harvard University, M.I.T., Yale University, United States Naval Academy, University of Pennsylvania, Princeton University, Rutgers University, Syracuse University, and the University of Wisconsin. The event will also mark the 101st annual meeting of the crews of Harvard and Yale—the oldest collegiate competitors in America.

The site of the regatta will be the Potomac River. The start will be about one mile downstream from the well-known Lincoln Memorial. All races will be over a 2,000-meter course and rowed along the west sea wall of Hains Point. Crews will be visible throughout the entire length of the course from any point along that wall.

Robert K. Thulman, '22, whose address is 2913 Stanton Avenue, Silver Spring, Md., represents M.I.T. in helping to stage the regatta, and in tying in activities of the Washington Society of the M.I.T. to the regatta. Further information may be obtained from Mr. Thulman, or from hosts for the regatta, the Washington Rowing Association, Inc., Star Building, Wash-

ington, D.C. Officials in Washington are co-operating to make the event thoroughly enjoyable for all.

Racing will start at 9:00 A.M. with qualifying heats for freshman crews, followed with heats for junior varsity and varsity crews at 10:00 and 11:00 A.M., respectively. The first three crews in each heat will compete in final events in the afternoon.

HISTORY OF STATIC ELECTRICITY

(Continued from page 366)

we have seen, important observations and discoveries in electricity resulted. But each of these new discoveries was more or less isolated and one did not serve to bring forth the other.

In the middle of the Eighteenth Century a new invention was needed for a revival of interest in electrical science. A means had been at hand for producing the electrical force at will for almost a century. A means for storing this force after it was produced was needed. The invention of the Leyden jar was the answer. This single instrument was responsible for a great revival of interest in the study of electricity, and for 50 years after its invention important discoveries and observations poured forth in electricity, which could not have been made without this instrument.

We shall probably never know who first invented the Leyden jar. Its discovery has been credited to Bishop Ewald Georg von Kleist, Dean of the Cathedral of Comin, in Pomerania, and to the celebrated Professor Pieter van Musschenbroek of the University of Leyden. This invention was probably made independently by both, and sometime about the year 1745.¹¹

In its original form the Leyden jar was simply a glass bottle containing water. The water was connected to the electric generator by means of a metal wire, and the operator held the bottle in his hand. The jar could accumulate a very strong charge which became apparent by touching the wire leading to the water. Writing in 1746 to a friend, Musschenbroek describes the historic shock he received from the jar in the following words: "Suddenly, I received in my right hand a shock of such violence that my whole body was shaken as by a lightning stroke. The vessel, although of glass, was not fractured nor was the hand displaced by the commotion, but the arms and body were affected in a manner more terrible than I can well express. In a word, I thought I was done for."¹²

While the Leyden jar served as the key instrument in many investigations, it in itself was studied in detail and improved upon by many workers. In fact, it was the father of the modern electrical condenser. With the aid of the Leyden jar the idea of the closed electrical circuit became established, an idea of the almost instantaneous speed of electrical force became realized, and the knowledge that the earth, as well as water, could be used as a part of an electrical circuit became known.

Because of the great electrical force which could be accumulated in the Leyden jar, its use in spectacular experiments caused a widespread interest in electricity among people in general. One of the most striking experiments of this type was that performed

by the famous Abbé Nollet with the co-operation of the whole community from the great convent of the Carthusians in Paris. A Leyden jar was discharged through a circuit over a mile long. This circuit consisted of hundreds of monks alternating with short lengths of iron wire from person to person. We are told that, "upon a discharge of the Leyden jar the whole company of monks gave a sudden spring at the same instant, and all felt the shock equally."¹³

The Leyden jar also served in many thousands of important but less spectacular experiments. Perhaps none were more important than those great experiments of Benjamin Franklin on lightning. This work of Franklin is so important to the history of static electricity and so wrongly known, that it bears retelling.

Franklin and the Lightning Controversy

Before it had been shown that lightning is a discharge of electricity similar to that obtained from frictional electric machines and Leyden jars, the terrifying effects of thunderstorms were supposed to result, in the words of an early writer, "from explosions caused by the spontaneous ignition of sundry exhalations which had the habit of accumulating in the upper atmosphere." Before this the terrifying thunder and lightning were simply attributed to either the anger of God or to the work of the devil — the choice depending on whether one's friend or enemy had been struck by lightning at the particular time.¹

It is undoubtedly true that, before Franklin, several physicists had hinted at the similarity between electricity and lightning, but they did not pursue the subject. It is also true that Franklin was not the first to draw electricity from the clouds and prove experimentally that the "electric force" thus obtained was the same as that produced by rubbing a piece of amber. It is true that Franklin suggested the manner in which these experiments might be carried out, and he, independently of others, carried out the most satisfactory set of experiments and formed the clearest conclusions. Here is the story of the lightning controversy as we know the facts today.

Franklin was the first to observe the properties and effects of pointed bodies, both in drawing and throwing off static electricity. This knowledge was fundamental to the planning of experiments for drawing down electricity from the clouds. Also, in Franklin's diary, with the date of November 7, 1749, there are notes suggesting many reasons why lightning may be the same as the electric force. In a letter to Collinson in London, written a bit later, these reasons are clearly stated and suitable experiments for proving his theory are suggested.

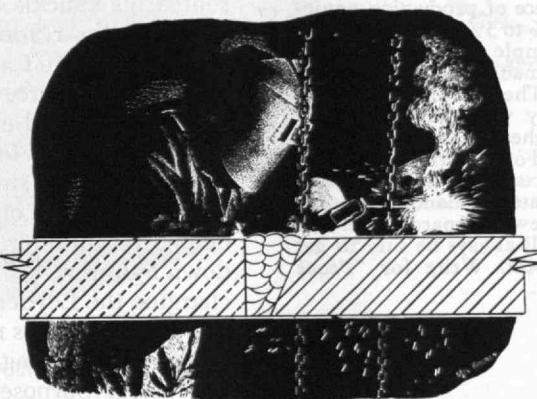
In France, the scientists Buffon, D'Alibard, and DeLor were keenly interested in Franklin's work and planned to make experiments in accordance with Franklin's suggestions.¹⁴ At Marly in France, D'Alibard, following Franklin's suggestions, erected a pointed rod 40 feet long and one inch in diameter and insulated from the ground. On May 10, 1752, during a heavy thunderstorm, sparks were drawn from this rod, and one week later DeLor drew sparks from an

(Continued on page 378)

BUSINESS IN MOTION

To our Colleagues in American Business ...

Late last year an important customer surprised us with an emergency call for help. It is a large company, and an unusually capable fabricator, so it is seldom indeed that it asks us for more than metals. Now it was not only having trouble, but was fast approaching a penalty period of \$2,400 a day for failure to deliver. The difficulty arose in butt-welding aluminum bronze to steel, so two of the men from the Welding Section of the Revere Research Department assembled their equipment and left at once. They found that the test specification called for welding 1½ inch plates, and then making a side bend without damage. This had nothing to do with the stress conditions which the pressure vessel would experience in service, but there it was, and welders had to be qualified by that test. Nobody had been able to pass it, which was why we were asked for collaboration.



- Working closely with the customer, and with the inspectors assigned to approve the work, our welding engineers dug deep into this problem. On Saturday, Sunday and Monday five test plates were made, each showing a definite improvement, though extreme difficulty was experienced in getting a satisfactory joint at the root of the weld. This was due to the fact that the design called for a 25-degree bevel on the steel plate, and no bevel on the aluminum bronze. Good fusion was impossible at the root, as was proved when the bottom of a test piece was cut off; the upper three-quarters of the weld then made the side bend satisfactorily.

- After close mutual analysis of the problem, per-

mission was obtained to open the joint to a 60-degree angle, to correspond with the joint of the actual vessel. The following day welds of the joint were made without difficulty, and passed the severe test without question. The remainder of the week was occupied in setting up the welding equipment we selected, and instructing the customer's welders in the necessary procedures. One of the methods recommended involved the placing of the beads of weld

metal. Small beads were advised, and after each layer had been laid it was carefully power brushed to remove any oxides which otherwise might have caused planes of weakness.

- In all this work it was evident that our men were so obviously familiar with what they were doing, and with the practical limitations and opportunities of the job, that

they were able to bring the customer and the inspectors together in a mutual meeting of minds, by showing how to make a weld which would withstand the test. Production began to meet schedules thereupon, just in time to avoid the \$2,400 daily penalty.

- Revere finds that operating a welding service of this kind is good business. It increases our contributions to American industry, and is in line with the recommendations we have given in these pages for many years. Namely, that you take full advantage of the knowledge of your suppliers, as well as buy their materials. No matter what you purchase, nor from whom, there must be one or more firms by whose experience you can profit, if you will just ask for it.

REVERE COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

Executive Offices: 230 Park Avenue, New York 17, N. Y.

SEE REVERE'S "MEET THE PRESS" ON NBC TELEVISION, SUNDAYS

You can save 25% of operating costs

Spacemaster Model E
Electric Fork Truck

...through efficient
materials
handling methods

The most modern piece of production equipment can save only 3% to 5% of over-all operating costs, yet a simple effective materials handling system will many times "chop" operating costs by 25%. These savings, however, can be sustained only when the equipment employed is of the highest quality. That's why engineers in every field of industry recommend Lewis-Shepard Products — the most complete line of dependable materials handling trucks. Learn to specify Lewis-Shepard wherever possible . . . and you'll always be sure to get the savings you expect. Write for "Proof Booklet" and catalogs.

Jackstacker
Electric Truck

Jacklift
Electric Truck

Spacemaster Model M
Electric Fork Truck

Other Lewis-Shepard Products

Jacklift Hydraulic Hand Lift Trucks
Jacklift Mechanical Hand Lift Trucks
Totemaster Trucks
Spacemaster Portable Elevators & Cranes
Handy Hoister
Floormaster Trucks
Weldmaster Skid Platforms
Loadmaster Storage Racks

LEWIS-SHEPARD®

Nationwide Service — See "Trucks, Industrial"
in your Yellow Phone Book

LEWIS-SHEPARD Products, Inc.
1044-5 Walnut St., Wateertown 72, Mass.
Please send me your "Proof Booklet" and Catalogs.

Name _____ Title _____



The "MASTER" Line

Name _____

Company _____

Street _____

State _____

HISTORY OF STATIC ELECTRICITY

(Continued from page 376)

insulated pole 99 feet high, which he had erected in Paris at the request of Buffon.

At about the same time, Franklin was erecting an insulated rod in Philadelphia — completely without knowledge of the Frenchmen's experiments. Before he was ready, he conceived the idea of sending up a kite which could easily reach heights many times greater than could be obtained with a rod. Franklin's first successful experiment with the kite was accomplished in June, 1752. Franklin's friend, Joseph Priestley, a few years later, writes:

"The kite being raised, a considerable time elapsed before there was any appearance of it being electrified. One very promising cloud had passed over it without any effect when, at length just as he (Franklin) was beginning to despair of his contrivance, he observed some loose threads of the hempen string to stand erect, and to avoid one another, just as if they had been suspended on a common conductor. Struck with this promising appearance, he immediately presented his knuckle to the key," Priestley interpolates here, "let the reader judge of the exquisite pleasure he must have felt at this moment, the discovery was complete. He perceived a very evident electric spark. Others succeeded even before the string was wet, so as to put the matter past all dispute, and when the rain had wet the string he collected electric fire copiously." Franklin, of course, continued his studies in detail, performing many experiments by drawing down lightning with kites and with pointed rods, and charging the Leyden jar many times.^{15,16}

Now, some of us may say, "so what?" Did the mere proof that lightning was the same as electricity serve any useful purpose? Was electrical science greatly advanced by this discovery? To this we must say, "yes." For not only did this knowledge contribute toward the intellectual development of mankind and remove some of the cobwebs of superstition from the minds of men, but it resulted in the practical protection of life and property from destruction by lightning, and to the advancement of electricity in general and static electricity in particular.

Science of Static Electricity Becomes of Age

A science is generally considered to have reached maturity when its conceptions can be expressed in mathematical terms. The science of electrostatics, or static electricity, thus became of age with the work of two men working independently, Cavendish and Coulomb — two men as different in personality and training, and in private life, as can be conceived, yet in their method of approach to science, "identical twins." The question they asked was not simply, "how" or "why," but "how much."

Henry Cavendish was one of the leading English scientists of the Eighteenth Century. He was eccentric, afraid of people, and particularly of women, but he contributed greatly to the progress of physics and chemistry. Although one of the richest men in all Europe, he cared nothing for the things that money

(Continued on page 380)

ME . . .

an AIRCRAFT engineer?

But I haven't majored in
aeronautical engineering

That doesn't matter.

Lockheed can train you...
at full pay!



It's your aptitude, your knowledge of engineering principles,
your degree in engineering that count.

Those—plus the opportunity Lockheed is offering you—are all you need for a career as an aircraft engineer. In Lockheed's special program for engineering graduates, you may go back to school, or you may convert to aircraft work by doing—on-the-job training. But whichever it is, you receive full pay while learning.

But Lockheed offers you more than a career. It offers you a new life, in an area where living conditions are beyond compare. Outdoor living prevails the year-round. Mountains, beaches are an hour from Lockheed.

See your Placement Officer today for the details on Lockheed's Aircraft Training Program for engineers, as well as the better living conditions in Southern California.

If your Placement Officer is out of the illustrated brochures describing living and working conditions at Lockheed, write M. V. Mattson, Employment Manager

This Plane made History



The P-38 Lightning—first 400 mile per hour fighter-interceptor, the "fork-tailed Devil" that helped win World War II.

This Plane is making History



The Super Constellation—larger, faster, more powerful; the plane that bridges the gap between modern air transport and commercial jet transport.

This Plane will make History



The jet of the future—the plane you will help create—belongs here.

This plane—which exists only in the brain of an engineer like yourself—is one reason there's a better future for you at Lockheed. For Lockheed will always need engineers with ideas, engineers with imagination, engineers who build the planes that make history.

Lockheed
Aircraft Corporation

Burbank, California

HEVI DUTY

Precision Electric
Heat Treat Furnaces
(Laboratory and Industrial)

Dry Type
Air Cooled Transformers
(to 1000 KVA)

Constant Current
Regulators *(Static Type)*

Many nationally known laboratories and manufacturing plants use Hevi Duty Electric Heat Treating Furnaces where maximum performance is desired.

Hevi Duty specialty transformers are used extensively in the electrical control of industrial machinery and plant power distribution.

Airport and street lighting have been made safer and maintenance costs have been reduced through the use of Hevi Duty static type Constant Current Regulators.

Write for descriptive bulletins

HEVI DUTY ELECTRIC COMPANY

HEVI DUTY

HEAT TREATING FURNACES • ELECTRIC EXCLUSIVELY
DRY TYPE TRANSFORMERS—CONSTANT CURRENT REGULATORS

MILWAUKEE 1, WISCONSIN

Harold E. Koch, '22, President

Elton E. Staples, '26, Vice President

HISTORY OF STATIC ELECTRICITY

(Continued from page 378)

could buy, and only the study of science afforded him any pleasure. He lived the life of a hermit and only shyly ventured forth in later years to spend an occasional evening in the company of other scientists.

Cavendish was methodical to a superlative degree and this characteristic appears in his work and scientific publications. Even in his private life, the same desire for accuracy and method existed. Possessing a large and fine scientific library, which he alone used, nevertheless upon taking a book from the library shelves, he would charge himself with it and would carefully credit the entry when the book was returned to its proper shelf.

Cavendish's work in chemistry on the composition of water and the properties of hydrogen are well known to all of us. Besides this, he determined the average density of the earth and gave the first proof and quantitative measurements of the force of gravity.

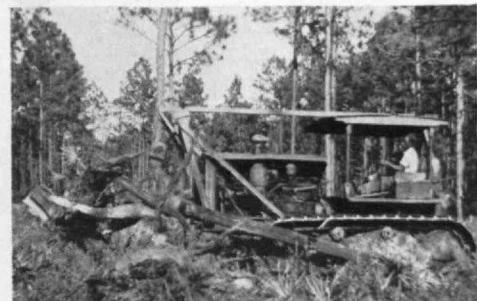
In the field of electricity, Cavendish was far ahead of his times, for he made measurements on the electrical resistance of materials with astonishing accuracy, and with equipment that we today would consider useless. Using the only means available to him at that time for measuring current — the electrical shock given to his own body — he was able to state in 1776 that, "iron wire conducts about 400,000,000 times better than rainwater," and that "seawater or a solution of one part salt in 30 of water conducts 100 times," and "a saturated solution of sea-salt, about 720 times better than rainwater." These figures are astonishingly close to those we have today, made with the most refined and complicated apparatus.

Besides his work on conductivity, Cavendish made many exact studies on the electrical capacities of condensers and surfaces. He was probably the first to have a clear idea of what we call electrical potential, and which he called, "degree of electrification." Finally, Cavendish conducted a series of experiments which caused him to conclude that, "the electric attraction and repulsion is invariably as the square of the distance." This law of inverse squares however was given final and absolute proof by Coulomb.¹⁷

In 1785 Coulomb completely proved to the world the law of inverse squares, for in that year he published the results of his experiments with his wonderfully sensitive torsion balance, with which he made direct measurements of the forces between electrified bodies.

Coulomb's torsion balance is much better known to every student of physics than his life. His balance was uncomplicated, carefully devised, and amazingly accurate. Its parts consisted of such ordinary things as a glass cylinder, silver wire, a thin straw covered with shellac, varnish paper, and ordinary pith balls. With this instrument he made his measurements, which not only established the mathematical expression for electrical attraction and repulsion, but which defined the unit of electricity or electrical quantity — a unit which today is properly called the coulomb.

Coulomb's life was complicated, full of contradictions
(Continued on page 382)



CABOT PINE PRODUCTS

for the RUBBER, CORDAGE, and PAINT industries

Cabot, famous as the world's largest carbon black producer, also manufactures for industry a line of top quality pine products through its Retort Chemical Division at Gainesville, Florida.

The Florida plant, one of the largest of its type in the industry, was acquired by Cabot in 1945. Plant facilities were improved and modernized to meet particular Cabot requirements, and new and additional equipment was installed to provide increased production.

Cabot pine products are used today primarily in the rubber, cordage and paint industries, and specific grades are used in the metallurgical, printing ink, insecticide, mining and paper industries. Constant control and evaluation of product quality throughout the production process maintains consistent Cabot pine product uniformity. Modern laboratories, completely equipped with the latest testing apparatus, are competently staffed to give experienced advice on product application. Trained Cabot Technical Service representatives are ready to provide additional information on Cabot pine products and to help you to select the grade most suited to your specific needs.

*For further technical information and for samples, write to
GODFREY L. CABOT, INC., 77 Franklin St., Boston 10, Mass.*



Light Pine Tar	PT 400
Medium Pine Tar	PT 600
Heavy Pine Tar	PT 800
Pine Tar Oil	PT 101
Light Pine Oil	PT 67
Pine Solvent	PT 150
Destructively Distilled	
Wood Turpentine	PT 140
Dipentene	PT 160
Softwood Pine Charcoal	Lump or Ground

If You Need Additional Manufacturing Capacity

CALL IN

LIQUID'S CONTRACT MANUFACTURING DIVISION

◆ Capacity and manpower available on Machine Shop, Sheet Metal and Woodworking facilities for industrial or defense contracts.

Write for illustrated booklet "Special Contract Department" which lists and describes facilities.



Contract Manufacturing Division

THE LIQUID CARBONIC CORPORATION
3100 South Kedzie Ave. Chicago 23, Illinois

Manufacturers of Brewing and Bottling Machinery, Soda Fountains, Gas Welding Equipment CO₂ Gas, Dry Ice, Oxygen and Medical Gases

HISTORY OF STATIC ELECTRICITY

(Continued from page 380)

tions and often unhappy. Coulomb, born in France, in 1736, five years after Cavendish, also came from a family of high social standing. Coulomb was trained as a military engineer and spent a number of years in engineering work in France and on the island of Martinique. Unfortunately, Coulomb was not a politician, and his rigid scientific accuracy in his engineering reports did not always fit the desires of those who stood to gain financially by slight deviations from this accuracy. Because of this uncompromising honesty, Coulomb made enemies in high places who succeeded in upsetting his engineering career.

Coulomb was a great scientist, however, and in spite of ill health and many misfortunes, he was able to find solace in his work on electricity. Like Cavendish, Coulomb studied the distribution of electricity over the surface of conducting bodies. He showed that "distribution of electricity over the surface of two bodies brought into contact, or merely within each other's influence, depends upon the shapes and dimensions of these bodies and not upon their material or mass." In this work he used a torsion balance so sensitive that a force equivalent to 1/60,000 of a grain could easily be measured.

Although Coulomb was a fine mathematician, he was not able to obtain a mathematical expression for the distribution of electricity on the surface of bodies.

(Concluded on page 384)



For over 80 years
Quality and Dependability



NATIONAL has a background of over eight decades in producing quality malleable, heat-treated malleable and steel castings—ideal materials for economy and dependability in manufacturing automotive, agricultural and other equipment.

SEE

"This Moving World"

A 16mm Technicolor film. Narrated by Edwin C. Hill, this 27-minute film tells how malleable iron is made...tested...used...how its production economy, ductility, machinability, toughness will give you a better finished product. Available for group showings.

NATIONAL'S unparalleled experience—coupled with a continuing metallurgical research program, rigorous quality control standards, and completely mechanized foundries in strategically located cities—is at your disposal.

Sales offices and engineering facilities are located at all five plants listed below.

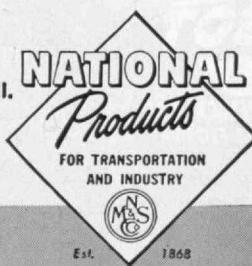
A-5306

PLANTS LOCATED IN

Sharon, Pa., Cleveland 6, Ohio,
Indianapolis 6, Ind., Melrose Park, Ill.,
and Chicago 50, Ill.

NATIONAL MALLEABLE and STEEL CASTINGS COMPANY

Cleveland 6, Ohio





Model 622—Ultra-Sensitive Instruments

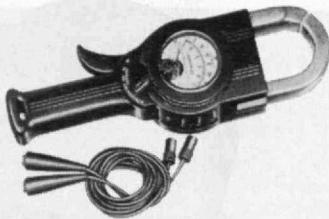
Portable d-c and a-c thermo instruments for precision measurement of potentials and minute currents in electronics or laboratory research.



Model 901

Portable Test Instruments

Available in d-c, Model 901—and a-c, Model 904, single and multiple ranges of wide coverage. Excellent scale readability and shielding. Accuracy within $\frac{1}{2}$ of 1%.



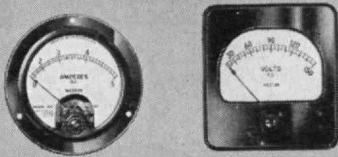
A-C Clamp Volt-Ammeter

(Model 633, Type VA-1) For convenient and rapid measurement of a-c voltage and current without breaking the circuit. Jaws take insulated or non-insulated conductors up to 2" diameter. Safe, rugged, versatile. Also available as a-c clamp ammeter, without voltage ranges.



Sensitive Relays

A line of sensitive relays including the Model 705 which provides positive operation at levels as low as $\frac{1}{2}$ microampere. Non-chattering magnetic contacts handle up to 10 watts at 120 volts.



Panel and Switchboard Instruments

A complete line of instruments in all types, sizes and ranges required for switchboard and panel needs . . . including d-c, a-c power frequencies and radio frequency, rectifier types and D.B. meters.



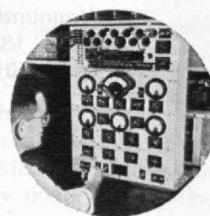
Model 697 Volt-Ohm-Milliammeter

One of a line of pocket-size meters, Model 697 combines a selection of a-c and d-c current, and resistance ranges. Ideal for maintenance testing and many inspection requirements.



Model 1411 Indctronic D-C Amplifier

Stable amplifier provides high degree of resolution even at fractional loads. Reaches steady full scale deflection in a fraction of a second. Interchangeable plug-in range standards for either microamperes or millivolts.



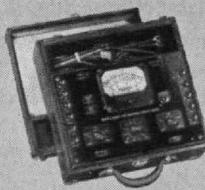
**Model 686
Electronic Tube Analyzer**

Tests tubes under exact operating potentials. Accurately determines true mutual conductance of all tubes, in accordance with manufacturers' rated operating conditions, or under special operating conditions.



**High Frequency Electronic Analyzer
Model 769**

A three-in-one instrument providing a self-contained Volt-Ohm-Milliammeter, a high impedance electronic D-C Volt-Ohmmeter, and a probe type Vacuum Tube Voltmeter for use to 300 megacycles. Exceptionally stable and accurate. Has specially designed extremely small RF and D-C probes.



Industrial Circuit Tester—Model 785

A multi-range, multi-purpose, ultra-sensitive analyzer, for laboratory and industrial checking of electrical and electronic circuits. Has 28 practical scale ranges; measures d-c and a-c voltage, d-c and a-c current, and resistance. Accessories available to extend ranges. Compact and portable; furnished in either oak or steel case.

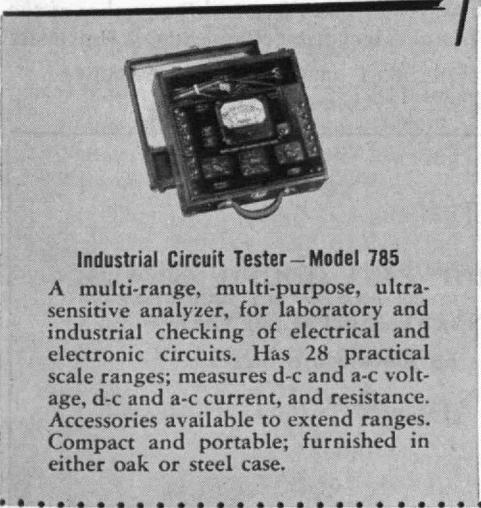
*Specialized and
Multi-purpose*

INSTRUMENTS

- for • RESEARCH
• PRODUCTION
• MAINTENANCE

For complex, or just routine measurement jobs, these and other specialized WESTON Instruments save time and assure dependable measurements. For information on the complete line, see your local Weston representative, or write . . . WESTON Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5, N. J.

WESTON
Instruments





Bob Armstrong likes to help people

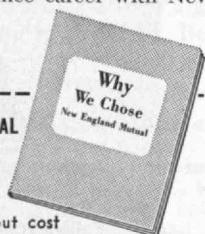
Robert B. Armstrong was a graduate biologist when he left Colgate University in 1945. Like most of us, he was searching for his place in the world.

He spent two years in research. But Bob missed people. He wanted to help them personally rather than indirectly. He left the laboratory to look for something else.

Then, one day, Bob had a heart-to-heart talk with an old college classmate. This friend, a New England Mutual agent, pointed out how a career in life insurance offers unlimited opportunities for helping people.

In remembering that conversation now, Bob says: "It became clear that New England Mutual offered the very thing I was looking for—a chance really to help people and at the same time build a successful future for myself. Yes, the life insurance business has been good to me—very good!"

Why not find out for yourself how you can build your future at New England Mutual? Mail the coupon below for a booklet in which 15 men tell why they chose a life insurance career with New England Mutual.



NEW ENGLAND MUTUAL
Box 333
Boston 17, Mass.

Please send me, without cost or obligation, your booklet, "Why We Chose New England Mutual."

Name _____

Address _____

City _____ Zone _____ State _____

The NEW ENGLAND MUTUAL Life Insurance Company of Boston
The company that founded mutual life insurance in America—1835

HISTORY OF STATIC ELECTRICITY

(Concluded from page 382)

It remained for another French scientist, Poisson, to put the pioneer work of Coulomb into mathematical form, five years after Coulomb's death. Nevertheless, the title, "Father of the science of electrostatics" is due more to Coulomb than to any other man.¹⁸

Mr. Edelstein will discuss the effects of static electricity in the textile industry and the use of chemical antistatic agents on new fibers, in the conclusion of his article, Part II, which will appear in the June, 1953, issue of *The Review*.

REFERENCES

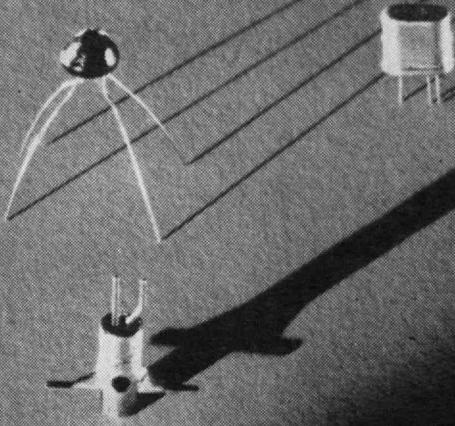
1. Alfred Still, *Soul of Amber* (New York: Farrar, Straus and Young, Inc., 1944).
2. Henri Martin, *La Foudre, L'Electricite et le Magnetisme chez les Anciens* (Paris, 1866).
3. Silvanus P. Thompson, *Gilbert of Colchester* (London: Chiswick Press, 1891).
4. Guilielmi Gilberti, *De Magnete, Magneticis que Corporibus, et de Magno Magnete Tellure*, pages 46-60 (London, 1600).
5. William Gilbert, *On the Loadstone and Magnetic Bodies*, Translated by P. Fleury Mottelay, pages 74-97 (New York, 1893).
6. Robert Boyle, *Experiments and Notes about the Mechanical Origine or Production of Electricity* (London, 1675).
7. Otto Von Guericke, *Experiments Nova Magdeburgica* (Amsterdam: Waesberge, 1672).
8. Martinus Van Marum, *Description d'une Tres Grande Machine Electrique* 1785, 1787, 1795 (Haarlem, 3 volumes).
9. John Wesley, *The Desideratum or Electricity Made Plain and Useful* (London, 1760).
10. Joseph Priestley, *The History and Present State of Electricity with Original Experiments*, pages 43-52 (London, 1769).
11. Priestley, *op. cit.*, pages 80-99.
12. Jean Louis Jallabert, *Experiences sur L'Electricite* (Paris, 1748).
13. Priestley, *op. cit.*, page 98.
14. Carl van Doren, *Benjamin Franklin* (pages 156-173 (New York: The Viking Press, 1938).
15. Priestley, *op. cit.*, pages 171-172.
16. Benjamin Franklin, *Experiences et Observations sur L'Electricite Faites a Philadelphia en Amerique* (Paris, 1756, 2 volumes).
17. J. Clerk Maxwell, *The Electrical Researches of the Honourable Henry Cavendish* (Cambridge: University Press, 1879).
18. Stiles, pages 118-122.

William H. Coburn & Co.

INVESTMENT COUNSEL

68 Devonshire Street

Boston



WHAT IS THE TRANSISTOR? It is a tiny electronic device that can do amazing things for you by amplifying electric signals. It requires only a fraction of the power of a vacuum tube. It will be low in cost and last many times longer. Three types of **Transistors** are shown above, about actual size.

That's the LITTLE GIANT with the Big Future

The **Transistor**—invented at Bell Telephone

Laboratories—opens new doors to far-reaching improvements in telephone service and in other fields

Many important inventions for communications have come from the Bell Telephone Laboratories. Seldom, however, has there been a new discovery with the exciting promise of the **Transistor**.

This tiny device can amplify electric signals a hundred thousand times. It can do many things that vacuum tubes can do and many more besides. It is something entirely new, and works on entirely new principles.

Because it is so small and rugged,

and takes so little power, it can be used in ways and places beyond reach of a vacuum tube.

Invented at the Bell Laboratories to amplify the voice in telephone service, the **Transistor** is opening new doors of opportunity in other fields.

The Bell System has licensed thirty-eight other companies to make and sell transistors under its patents. This is in accordance with our established policy of making our inventions available to others

on reasonable terms. These include makers of advanced equipment for defense, as well as radios, television sets, hearing aids, and a wide range of electronic apparatus.

The **Transistor** is already being used in the new electronic equipment which enables telephone users to dial Long Distance calls from coast to coast.

It is another example of the value of Bell System research in bringing you more and better telephone service.

BELL TELEPHONE SYSTEM



FLETCHER **g**ranite
rstandarized curb
adimension masonry
nbroke ashlar
ibridge puer facing
tbound posis
ethin veneers

Quick Delivery

H. E. FLETCHER COMPANY

WEST CHELMSFORD, MASSACHUSETTS
 • LOWELL 7588
 104 EAST 40TH STREET, NEW YORK 16, N. Y.

INDUSTRIAL NUCLEAR POWER

(Continued from page 362)

fuels. The world's annual rate of energy consumption is now 0.2Q per year. By 2000 A.D. it is expected to increase to 1Q per year. These figures suggest that we have from 25 to 50 years before we shall be driven to find energy supplements for coal, oil, gas, and falling water. In energy-starved parts of the world, the day will come sooner, if, indeed, it is not here already. In the United States, where we are blessed with an abundance of energy resources, we have longer. But it would be folly to wait until desperation drives us to learn how to use nuclear fuels. Clearly, nuclear power is important enough in our country's economy and close enough to being practical to warrant a serious development effort.

Causes of Delay

Let us see what this all adds up to in answering the question, "What is delaying industrial nuclear power?" The answers, in order of decreasing importance are: 1. Technical difficulty; 2. Lack of immediate need; 3. Security; 4. The Atomic Energy Act.

Development of nuclear power is an extremely difficult engineering undertaking, with profitable operation many years off and with hundreds of millions of dollars to be spent in development. With abundant supplies of energy from other sources, there is little need for nuclear power in this country at the present time. Nuclear power is being developed as a by-product of atomic weapons; the security restrictions that quite properly are imposed do not provide the climate of free and unrestricted inquiry conducive to the most rapid technical advances. Restriction on private ownership of uranium, thorium, and fissionable materials, or of patents, plants and processes in the nuclear field discourages private firms from investing in or assigning their best men to this development.

Suggested Program

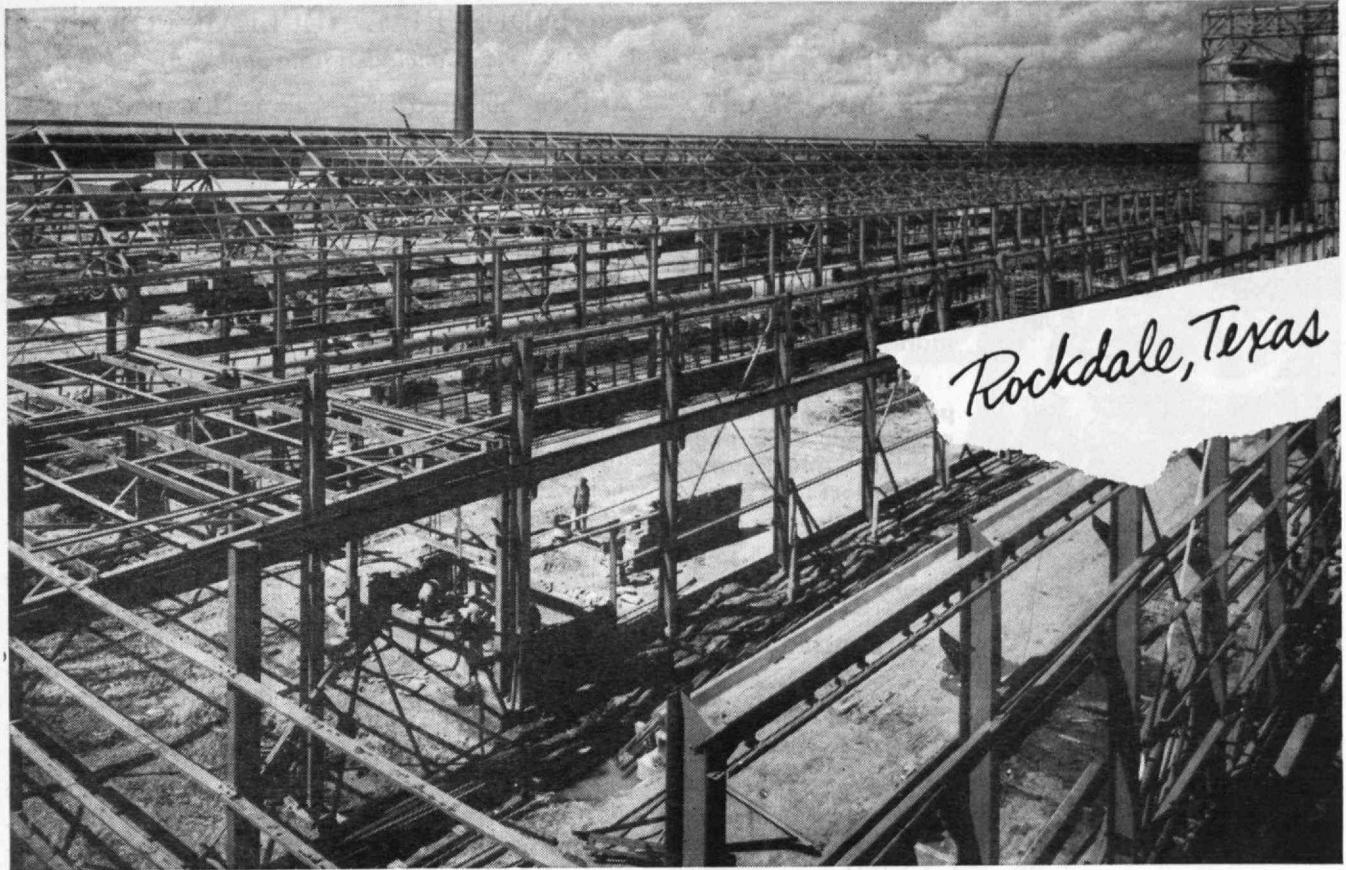
What then should be our program? The writer's personal views are:

1. The government and industry should build a limited number of dual-purpose reactors, to produce plutonium and power. The government should take the risk that the premium value of plutonium for military purposes may be of limited duration, in order to get practical experience with a nuclear power plant which may derive short-term credits from plutonium production. These reactors, preferably, should advance our knowledge of breeding.

2. We should encourage cost-minded private companies to enter the nuclear power field, to learn how to drive down the cost of nuclear power plants and advance the day when breeding will be economic. Revisions to the Atomic Energy Act which would permit private companies to own nuclear power patents would be a valuable incentive.

3. Because the United States depends for survival on its continuing pre-eminence in atomic weapons,

(Concluded on page 388)



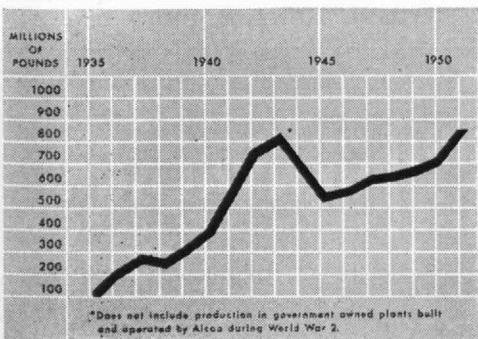
Is part of your future being built here?

Here you see the beginning of another addition to Alcoa's expanding facilities. This plant, at Rockdale, Texas, will be the first in the world to use power generated from lignite fuel and will produce 170 million pounds of aluminum a year. This and other new plants bring Alcoa's

production capacity to a billion pounds of aluminum a year, four times as much as we produced in 1939. And still the demand for aluminum products continues to grow. Consider the opportunities for you if you choose to grow with us.

What can this mean as a career for you?

This is a production chart—shows the millions of pounds of aluminum produced by Alcoa each year between 1935 and 1951. Good men



did good work to create this record. You can work with these same men, learn from them and qualify yourself for continually developing opportunities. And that production curve is still rising, we're still expanding, and opportunities for young men joining us now are almost limitless.

Ever-expanding Alcoa needs engineers, metallurgists, and technically minded "laymen" for production,

research and sales positions. If you have recently graduated, if you want to be with a dynamic company that's "going places," get in touch with us. Benefits are many; stability is a matter of proud record; opportunities are unlimited.

For more facts and application forms write to Personnel Dept., ALUMINUM COMPANY OF AMERICA, 1825 Alcoa Bldg., Pittsburgh 19, Pa.

Alcoa
ALUMINUM
ALUMINUM COMPANY OF AMERICA





NEW PRODUCTS ARE IMPORTANT

To swing the tide of prosperity it will be necessary for every industry to plan for the creation of new products to stimulate buying demand.

Where gears are a part of any new product or their production machinery, Diefendorf is interested.

**Engineering help
where needed.**

**DIEFENDORF GEAR
CORP.**

Syracuse, New York

DIEFENDORF GEAR

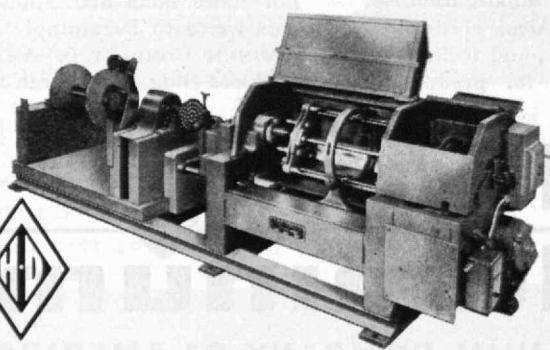
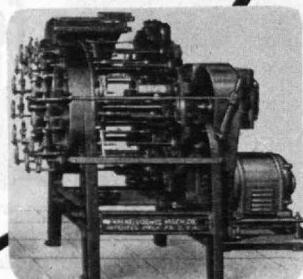
**SPECIALIZED EXPERIENCE, FACILITIES
AT YOUR SERVICE TO SOLVE YOUR
*bunching (twisting) and stranding problems***

Expanding application of twisting principles to the production of many products is reflected by an ever-increasing demand for both H-D standard equipment as well as machines especially engineered to solve varied production problems. Week after week surprising new uses are developed through the close co-operation of our engineering department with manufacturers in many fields.

Write today for our New Technical Bulletins. Tell us what you make —or contemplate making and your inquiry will receive prompt attention.

WRITE TODAY. YOUR INQUIRY
WILL GET PROMPT ATTENTION

HASKELL-DAWES
MACHINE CO., INC.
2231 E. ONTARIO ST.
PHILADELPHIA 34, PA.



(Concluded from page 386)

and will not need large-scale nuclear power for 25 years or more, there should be no relaxation of security solely to facilitate development of industrial nuclear power. We may be able to declassify basic nuclear data which we have reason to believe are known to Russia, but we should not declassify information on plants and processes even though this would advance development of nuclear power.

4. Within the existing security framework, dissemination of information should be facilitated. The Atomic Energy Commission's farsighted policy in clearing representatives of many companies and institutions and inviting them to work in the atomic energy field should be expanded even further. Regional libraries of classified documents should be established, so that technical workers in this field can have more of the convenient access to information which has been essential to other technical developments. Distribution of classified information should be liberalized, so that properly cleared individuals can have more of the information needed to further their work.

5. With fissionable material so vital to the security of the United States, it would be premature to amend the Atomic Energy Act to permit others beside the government to own U²³⁵ or plutonium. However, some liberalization of its provisions should be possible. Private companies should be allowed to own reactors, and to use fissionable material under government license. Outright private ownership of natural uranium should be considered, in view of its lower strategic value. Several companies have expressed interest in owning a natural uranium reactor producing power and a mixture of uranium and plutonium, which might be sold to the government for final processing. Such an arrangement would hardly endanger national security but would encourage nuclear power production by private companies.

The McMahon Act has been a wise and valuable law, but we are now at the point, envisaged in the act, itself, where amendment would be desirable to promote the participation of private companies in nuclear power development. The Atomic Energy Commission has been right in devoting most of its funds and effort to military applications of atomic energy, but the time has come when somewhat greater emphasis should be placed on large-scale engineering development of industrial nuclear power.

SCULLY SIGNAL COMPANY

**Safe Fills } with
No Spills } VENTALARM®
 WHISTLING TANK FILL SIGNAL**

E-B SMALL-FILE



for automotive, home
and diesel fuel tanks

88 First St., Cambridge 41, Mass.

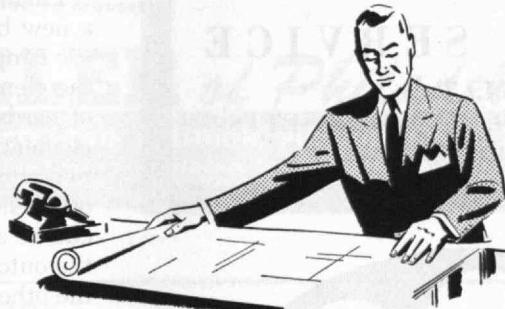
"JUST FILL

"TIL THE WHISTLE STOPS"

A QUESTION FOR ALL ENGINEERS:

Q. **Where will you be
10 years from now?**

A.



Will your achievements be recognized? Will you be associated with distinguished scientists and engineers? Will your work provide a challenge for your talent and ability? Will your position and income be founded upon your real merit?

At RCA, you'll find plenty of "future insurance" . . . and right now is the time to investigate RCA opportunities. Because RCA is now looking for experienced ELECTRONIC, COMPUTER, ELECTRICAL, MECHANICAL, and COMMUNICATIONS ENGINEERS . . . PHYSICISTS . . . METALLURGISTS . . . PHYSICAL CHEMISTS . . . CERAMISTS . . . GLASS TECHNOLOGISTS. Whichever your specialty, there's a chance of a lifetime for a

career with RCA—world leader in electronic development, first in radio, first in recorded music, first in television. RCA growth has remained steady through war and depression . . . you'll find positions open today in many commercial projects, as well as military lines.

WHY RCA IS A GOOD PLACE FOR YOU TO WORK

Facilities for creative engineering are top-notch. Working conditions and associates stimulate you. Periodic merit reviews help you advance in grade and income. Your family can enjoy pleasant country or suburban living. RCA encourages growth of your professional status and recognition. Company-paid benefits—including life, accident and hospitalization insurance—increase your feeling of security. You look forward to retirement through a progressive program. RCA has a modern tuition refund plan for advanced study at recognized universities.

Personal interviews arranged in your city.

Please send a complete resume of your education and experience to:

MR. ROBERT E. MCQUISTON, Manager, Specialized Employment Division
Dept. 206-E, Radio Corporation of America, 30 Rockefeller Plaza, New York 20, N.Y.

Positions Open In

RESEARCH—DEVELOPMENT— DESIGN—APPLICATION

in any of the following fields:

RADAR—Circuitry—Antenna Design—Servo Systems—Information Display Systems—Gear Trains—Stable Elements—Intricate Mechanisms

COMPUTERS—Digital and Analog—Systems Planning—Storage Technique—Circuitry—Servo Mechanisms—Assembly Design—High Speed Intricate Mechanisms

COMMUNICATIONS—Microwave—Aviation—Mobile—Specialized Military Systems

MISSILE GUIDANCE—Systems Planning and Design—Radar and Fire Control—Servo Mechanisms—Vibration and Shock Problems

NAVIGATIONAL AIDS—Loran—Shoran—Altimeters—Airborne Radar

TELEVISION DEVELOPMENT—Receivers—Transmitters and Studio Equipment

COMPONENT PARTS—Transformer—Coil—Relay—Capacitor—Switch—Motor—Resistor

ELECTRONIC TUBE DEVELOPMENT—Receiving—Transmitting—Cathode-Ray—Phototubes and Magnetrons

ELECTRONIC EQUIPMENT FIELD ENGINEERS—Specialists for domestic and overseas assignment on military electronic communications and detection gear.



RADIO CORPORATION of AMERICA

A Report TO M.I.T. MEN

In 1917 Walker Memorial Building was opened, a gift from Alumni for the welfare of M.I.T. students. In addition to including offices for student activities and serving as a student social center, this building houses the dining service.

In 1951-52 nearly one million meals were served to staff and students and 57 dances, receptions and balls were held in Morss Hall. Morss Hall seats approximately 500 people. Thus, each chair served 2,000 people per year or 5.5 persons per day. We thank the Alumni for making these services possible.

WALKER MEMORIAL DINING SERVICE

• M.I.T. •
CAMBRIDGE 39, MASSACHUSETTS
A. W. BRIDGES, Manager



Write for Free Brochure on:

- Piling • Pile Shells • Pile Fittings
- Prefabricated Piping
- SPEED-LAY System

S. G. Albert '29

ALBERT pipe supply co., inc.

BERRY AT NORTH 13TH ST. • BROOKLYN 11, N.Y.

OPERATIONS RESEARCH

(Continued from page 371)

It is often not too difficult to sub-optimize each of these divisions separately, so each is running smoothly and effectively as far as its own part of the business is concerned. But to be sure that all these parts mesh together to make the company as a whole operate most efficiently requires much more subtle analysis, when considering the problem, and very careful quantitative balancing.

In the interest of reducing factory overtime and to keep down inventory, for example, it may be necessary to modify the salesman's incentive commissions, so he will be induced to push one line over another. It may be necessary for the production division to allow more overtime in one department than another, to make some part of its operation run at less than optimum in order that the over-all operation be optimum; and one must take care not to penalize the production department, by reduced bonuses or the like, for reducing its efficiency in order that the effectiveness of the whole is improved. This is a sort of systems engineering for a complete business.

Finally, let me say a few words about game theory, a new branch of mathematics which is of occasional use in operations research. In this mathematical model the elements of competition, as evidenced in a game of cards, for example, are reduced to their simplest elements. The elementary concepts for the simplest, two-person game are that what one side gains the other side loses, that the opponents simultaneously choose a course of action (called a strategy) and that the outcome of the game (the payment of one side to the other) is determined by this dual choice of strategies. The outcome is not completely determined by either side alone, it is determined by the combined decisions of the two opposed players. This is, of course, the essence of actual games.

Analysis of the very simplest of games shows that there are two general kinds, which may be illustrated by two kinds of coin matching. In the first case the choice is between a penny or a nickel to match; if both coins are the same, it's a standoff, if the coins differ the penny takes the nickel. In this game it is always safest for either player to play a penny, for he then cannot lose, whereas if he plays a nickel, he may lose a nickel. Such games, where each opponent will find it safest always to stick to one strategy, are called single-

(Continued on page 392)

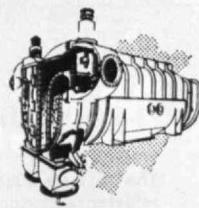


■ PRECISION PRODUCTS CO., Waltham, Mass.

DID YOU KNOW?

1 . . . that you can Clean Condenser Tube Sheets without Downtime or Loss of Pressure ?

C. H. Wheeler Reverse Flow Condensers are "Self-Cleaning". Electrically, hydraulically or manually operated sluice gates within the condenser reverse the flow of water in the tubes to flush debris and marine growth away from tube sheets.



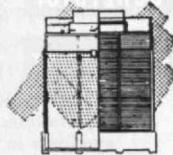
2 . . . that there are Vacuum Pumps with No Moving Parts . . . and often requiring No Extra Power ?

C. H. Wheeler Tubejets convert waste steam into useful vacuum for pumping, refrigeration, etc.



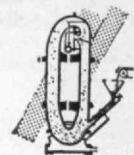
3 . . . that a Cooling Tower can be Built to Blend with a Building—or to Stand Alone against Hurricane Winds ?

C. H. Wheeler Water Cooling Towers may be sheathed with any building material to harmonize with an architectural plan. Sturdy construction is guaranteed for performance and durability.



4 . . . that Material will Grind Itself into Particles 100 Times Finer than the Human Eye Can See ?

C. H. Wheeler Fluid Energy Reduction Mills reduce materials to sub-micron particle sizes. Material is conveyed by air, steam or any gas or vapor in a closed circuit at supersonic speeds causing particles to reduce themselves by repeated shattering contact with one another.



Bulletins mailed on request.

C. H. WHEELER of Philadelphia

C. H. WHEELER MANUFACTURING CO., 19th & LEHIGH, PHILADELPHIA 32, PENNA.

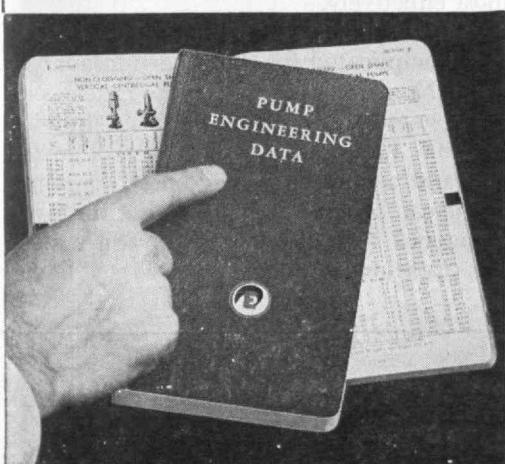
Steam Condensers • Centrifugal, Axial and Mixed Flow Pumps • Steam Jet Ejectors • Cooling Towers • Vacuum Refrigeration
High Vacuum Process Equipment • Micro-Particle Reduction Mills • Marine Condensers and Ejectors • Deck Machinery.

1952 PUMP ENGINEERING HANDBOOK

The Research Has Been Done For You

"PUMP ENGINEERING DATA"

has been compiled for professional and student engineers who want their information in one volume. Designed for ease of use, with tables, diagrams, and charts.



• • • was assembled by experts to provide the most pertinent and up-to-date material for pump engineering. Substantially bound in maroon and gold—contains over 400 pages.

• • • covers pumping problems encountered in buildings, waterworks, sewage treatment plants, oil refineries, mines and quarries, irrigation, power plants, food and chemical plants, paper mills, and in many other applications.

Send today for your copy of
"PUMP ENGINEERING DATA" \$3.00

WHEELER-ECONOMY PUMPS

ECONOMY PUMPS, INC. • Division of C. H. Wheeler Mfg. Co.
Sedgley at 19th and Lehigh • Philadelphia 32, Penna.

MICROSYNS

The Doelcam Microsyn is an electro-magnetic four pole, reluctance bridge unit providing rugged construction, inherent electrical and mechanical simplicity, and high accuracy performance in the following applications:

Position Indicator

— provides an electrical indication of angular displacement with high signal-to-noise ratio.

Stiffness Motor

— operates as a torsional spring with adjustable stiffness coefficient.

Torque Generator

— supplies a torque proportional to excitation and independent of shaft rotation.

Variable Inductor

— offers an inductance that varies linearly with shaft rotation.

The Doelcam Microsyn can be designed for special applications in a wide variety of sizes. Units are available in instrument housings or as rotor and stator combinations to provide for individual mounting.

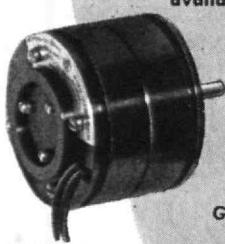
For more details, write to:

**DOELCAM
CORPORATION**

56 Elmwood Street, Newton 58, Mass.

Gyroscopic Flight Test and Control Instrumentation

SYNCHROS • SERVOMECHANISMS • MICROSYNS
ELECTRONIC INVERTERS • "TIMETERS" • "PERI-METERS"

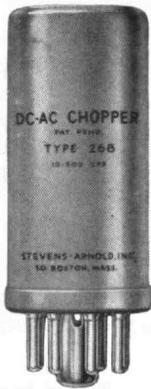


Position Indicator
Type 1C-001A

DC-AC CHOPPER

A model for every use — 60 and 400 cycles
Single pole and double pole — Make-before-break contacts — Contacts in air or in liquid

These Choppers convert low level DC into pulsating DC or AC, so that servomechanism error voltages and the output of thermocouples and strain gauges may be amplified by means of an AC rather than a DC amplifier. They are hermetically sealed, precision vibrators having special features which contribute to long life and low noise level.



WRITE FOR CATALOGS ..
#246B, 60 cycles, AC
#280, 400 cycles, AC

STEVENS-ARNOLD
INCORPORATED

22 ELKINS STREET, SOUTH BOSTON 27, MASS.

OPERATIONS RESEARCH

(Continued from page 390)

strategy games. They are not very interesting as games and are not often played.

The second general type of game may be illustrated by the usual penny matching, in which each player chooses heads or tails; if the coins match, the matcher wins, if they do not match, the matchee wins. In this case, if either player sticks to one strategy, he may consistently lose. If, for example, the matcher decides to play heads continuously, then the matchee, when he finds this out, can consistently play tails and win every time. As a matter of fact, any predetermined pattern of successive strategies (such as alternately playing heads and tails) for instance, could conceivably be foreseen by a clever opponent and countered, so that the losses would be continuous. The *only safe way* to play this game, therefore, is to play heads or tails in a completely random manner, as for instance by flipping the penny in the air just before one plays it. This is usually done in actual penny matching. It is interesting to see that it is *not* done to make the game fairer, but to protect each player from a too-clever opponent. Such games are called games of *mixed strategy*.

Of course, most games have more than two different choices of strategy for each player. The simple game called scissors-paper-stone has three choices, the game of ticktacktoe has dozens of possible alternatives, and checkers has thousands of possible strategies. In principle, once each player has chosen one of the set of strategies available to him, it is possible to calculate the probable outcome of the game. The net pay-offs can thus be arranged in a two-dimensional schedule; two-by-two for penny matching, 80 by 70 approximately for ticktacktoe, and thousands on a side for checkers. From the schedule we can find whether the game is a single or a mixed strategy one and, if mixed, in what proportions to mix the playing to confuse the opponent most effectively.

As usual with mathematical models, most actual games are too complicated for the theory to analyze in detail as yet. Nevertheless some of the crucial elements in many games may be clarified by studying simplified models. For example, in games of mixed strategy, bluff and counterbluff may enter. A simplified poker game can be analyzed in which it turns out to be advantageous to bluff occasionally on a poor

(Continued on page 394)

GEORGE W. McCREERY CO.

Building Construction

250 BOYLSTON STREET

BOSTON, MASS.

B.I.W.

PRESENTS YOUR ANSWER FOR AN ALL PURPOSE ELECTRONIC SHIELDED HOOK-UP WIRE

B.I.W. TYPE SRPF (SN)

B.I.W. long a manufacturer of standard thermoplastic insulated wires and of recent years a leader in the use of "Teflon" insulation on a wide variety of wires and cables, now introduces a new type which will fill an important requirement in electronic applications.

MINIATURE SIZE, abrasion resistance, moisture resistance, with high insulation resistance over wide temperature range combined with trouble-free soldering and assembly are features which readily appeal to specification engineers.

STANDARDIZATION on one type of shielded hook-up wire for military applications, a distinct improvement for commercial applications, with limitation on the sizes wins prompt approval of buyers. Relatively high priced at present, moderate prices can be anticipated with its general approval.

B.I.W. TYPE NUMBER	GAUGE AWG	DIAMETER $\pm .003"$	COVERING	CHARACTERISTICS
SRPF-26	26	.037"	None	TEMPERATURE RANGE: 150° C. to -55° C. CONTINUOUS AMBIENT RATING: 125° C.
SRPF(S)-26	26	.057"	Shielded	VOLTAGE RATING: 1000 RMS 1000 D.C.
SRPF(SN)-26	26	.070"	Shield and Nylon	INSULATION RESISTANCE: 10,000 megohms per m/ft. at room temperature, retains high values in boiling water.
SRPF-22	22	.047"	None	CAPACITANCE STABILITY: Relative low capacity stable over entire temperature range.
SRPF-(S)-22	22	.067"	Shielded	MOISTURE RESISTANCE: Zero absorption, with high surface resistivity.
SRPF-(SN)-22	22	.080"	Shield and Nylon	DURABILITY: As tough as Nylon but free from wrinkles after bending.
SRPF-18	18	.068"	None	WORKABILITY: Readily stripped, ends will not creep back during soldering.
SRPF-(S)-18	18	.088"	Shielded	FUNGUS-PROOF. FLAME-PROOF. SOLVENT-PROOF.
SRPF-(SN)-18	18	.105"	Shield and Nylon	IDENTIFICATION: SRPF presently available in white only, readily takes stampings; SRPF(SN) available in all colors or color combinations.

This miniature wire, having excellent physical and electrical characteristics is the answer to your wiring problems.

BOSTON INSULATED WIRE AND CABLE CO.

BOSTON 25, MASSACHUSETTS

*NEW YORK CENTRAL
TWENTIETH CENTURY LIMITED*
SPEEDING THROUGH THE
HUDSON RIVER VALLEY

**POOR & COMPANY
CHICAGO**

Manufacturers of Railway Equipment used by Railways throughout the world

IMPORTANT READING

The Common Sense of Science

by J. Bronowski

This is a book about the essential nature of science, how it appears in the life of each of us today and how its methods can be used in all we do. \$2.00

The Meaning of Relativity

by Albert Einstein

In this fourth edition of Mr. Einstein's classic presentation of special and general relativity, the author presents an extensively revised version of his appendix on Generalization of Gravitation Theory. \$3.50

Flying Saucers

by Donald H. Menzel

Truth is stranger than fiction and Dr. Menzel does far more than debunk flying saucers, which, he says, are as real as rainbows. \$4.75

Ex — Prodigy

by Norbert Wiener

Forty five years ago, the author was nationally known as a child prodigy. He tells here what it meant to grow up with that very mixed blessing. \$3.95

Annapurna

by Maurice Herzog

This is one of the great adventure classics of all time. The author was one of two men to master the highest mountain ever climbed by man. \$5.00

The Technology Store
40 Massachusetts Ave.
Cambridge 39, Mass.

Please send me

- The Common Sense of Science \$2.00
- The Meaning of Relativity \$3.50
- Flying Saucers \$4.75
- Ex-Prodigy \$3.95
- Annapurna \$5.00

Check Charge C. O. D.

The Technology Store

OPERATIONS RESEARCH

(Continued from page 392)

hand, and for the opponent occasionally to call a bet when he does not have a winning hand. From the payoff charts, giving the amounts of losses or winnings for each choice of strategies of the players, it is possible to calculate the relative frequency with which bluff or counterbluff should be employed.

It should be obvious that game theory is basic to many situations in battle. In fact, game theory was used by operations research groups during World War II to work out tactics, such as those to be used by a submarine in avoiding a searching aircraft (when to dive and when to surface and run for it) and also in the tactics to be used in an air engagement between a bomber and an opposing fighter.

In particular, the timing of the gunfire duel between fighter pilot and tail gunner of the bomber, as the fighter closes in for the kill, is a good example of what has been called the duel problem. If the fighter, for example, fires his rounds too early, he has a greater chance of missing, and he may be out of shells or rockets by the time he gets in close. If, on the other hand, he waits to fire till he gets in close, the tail gunner may shoot him down before he fires a round. Once the relative accuracy of the opposing guns, the vulnerability of the airplanes and the number of available rounds are known, it is possible to use game theory to calculate the best range at which to commence firing and the probability that fighter or bomber be shot down. These probabilities turned out to check fairly closely with the results of actual air duels in World War II, whereas the results computed without the use of game theory gave erroneous values and prescribed unsafe tactics. Both the submarine search and the duel problem are examples of games with a continuous range of possible strategies; these games are, in general, much more difficult to solve than those with only a small

(Continued on page 396)

NORTHEASTERN UNIVERSITY *School of Law*

Day and Evening
Programs

Leading to the
Degree of Bachelor of Laws
GRADUATE CURRICULUM
CO-EDUCATIONAL

For catalog write, Dean Lowell S. Nicholson

47 Mt. Vernon Street
Boston 8, Massachusetts

THE TECHNOLOGY LOAN FUND BOARD

Report for the Year 1952

For the fourth calendar year since the war, new loans made exceeded repayments on outstanding notes, these totals for 1952 being \$212,903 and \$88,307, respectively. By the end of December, 1952, 2,467 individuals — or nearly 68% of the 3,644 receiving loans since the Fund was established in 1930 — had completely discharged their indebtedness to it. The data presented below summarize the Fund's transactions during 1952 together with cumulative figures for the past twenty years.

THE TECHNOLOGY LOAN FUND BOARD

J. A. Stratton
 J. J. Snyder
 T. P. Pitre
 J. T. Rule
 D. L. Rhind, *Secretary*
 H. E. Lobdell, *Chairman*

Cambridge

March 1, 1953

CUMULATIVE RECORD OF THE TECHNOLOGY LOAN FUND TO DECEMBER 31, 1952

	<u>At Dec. 31</u>	<u>At Dec. 31</u>	<u>Net changes</u>	
	<u>1952</u>	<u>1951</u>	<u>during 1952</u>	
ITEMS OF OUTGO:				
Number of Men Receiving Loans	3,644	3,382	up	262
Total Amount Loaned	\$2,647,928	\$2,435,025	up	\$212,903
Average Per Capita Loan	\$ 727	\$ 720	up	\$ 7
ITEMS OF INCOME:				
Number of Men Whose Indebtedness has been Completely Discharged	2,467	2,357	up	110
Principal Repayments in Advance	\$ 639,927	\$ 618,078	up	\$ 21,849
Other Principal Repayments	<u>\$ 1,299,223</u>	<u>\$ 1,232,765</u>	up	\$ 66,458
Total Principal Repayments	\$1,939,150	\$1,850,843	up	\$ 88,307
Total Principal Matured, Considering "Advance Repayments" as Matured when Paid	\$1,973,255	\$1,882,891	up	\$ 90,364
Collection Ratio, i.e. Percentage of Total Maturities Paid	98.2	98.2		
Matured Principal in Arrears	\$ 24,676	\$ 22,679	up	\$ 1,997
Actual "Written Off" Accounts	<u>\$ 9,428</u>	<u>\$ 9,370</u>	up	\$ 58
Total Maturities Unpaid	\$ 34,104	\$ 32,049	up	\$ 2,055
Percentage "Written Off" to Total Loans	0.35	0.38	down	0.03
Percentage Matured Loans in Arrears plus Amount "Written Off" to Total Loans	1.28	1.32	down	0.04
Interest Received	\$ 242,973	\$ 236,891	up	\$ 6,082
Times Interest Received to Matured Loans in Arrears plus Amount "Written Off"	7.1	7.4	down	0.3
NOTES OUTSTANDING	\$ 699,350	\$ 574,812	up	\$124,538

NEWTON WALTHAM WATERTOWN
RIGHT HERE
 (near Cambridge)
 AT

 QUINCY BEDFORD
you may well establish
YOUR CAREER IN ENGINEERING

Research and development opportunities abound in the great and growing fields of

RADAR

ELECTRON TUBES

CATHODE RAY TUBES

COMMUNICATIONS

GUIDED MISSILES

MAGNETRONS

KLYSTRONS

TRANSISTORS

SERVOMECHANISMS

COMPUTERS

ULTRASONICS

UNDERWATER SOUND

PRODUCTION,

QUALITY CONTROL, DESIGN, AND AUTOMATION

BOOKLET — picturing and describing the many and varied Raytheon career opportunities may be picked up at the M.I.T. Placement Office, Room 1-173, or will be mailed on request.

RAYTHEON MANUFACTURING COMPANY
WALTHAM 54, MASSACHUSETTS

OPERATIONS RESEARCH

(Continued from page 394)

number of alternate strategies available for each opponent.

It should not be hard to see that game theory also has its applications in business. It has been used, to some extent, in deciding on the timing of an advertising campaign, when several companies are competing for the same market.

But perhaps these few, simple examples are enough to show that the techniques developed to increase our understanding of the nature of the physical world can also be used to help us understand many other phenomena. In many cases in industry and war, a simplified quantitative model of the situation can help us see what goes on and can help us devise the best way to proceed. We have seen that in many cases, in genetics, in waiting lines, and in games, to name a few, it is not necessary to have a complete picture of all that goes on, clear down to all the basic details. As long as our mathematical model can be adjusted to fit some of the regularities which appear, we can abstract these parts of the behavior from the rest and study it separately. The process of abstraction, of keeping clear of local details, has the advantage of providing a model which may fit a variety of circumstances; restaurants, production lines, or landing aircraft. By gaining in generality, of course, we lose in detail, as may easily be seen.

(Concluded on page 398)

Lord Electric Company

INCORPORATED

FOUNDED BY F. W. LORD, M.I.T. '93

1895

ELECTRICAL CONSTRUCTION

1953

131 Clarendon Street
Boston 16, Massachusetts
Telephone COMMONWEALTH 6-0456

10 Rockefeller Plaza
New York 20, N. Y.
Telephone CIRCLE 6-8000

1201 Plaza Building
Pittsburgh 19, Pa.
Telephone COURT 1920

The TREDENNICK-BILLINGS CO.

Construction Managers

K. W. RICHARDS '07

H. D. BILLINGS '10

Building Construction

C. C. JONES '12

F. J. CONTI '34

10 HIGH STREET

BOSTON, MASSACHUSETTS



Investment Consultation Service

An Investment Consultation Account is one in which you employ the Investment Division of our Trust Department to advise you in the investment of your property. It is purely advisory; you continue to keep your own records and to handle your own securities. Its purpose is to help you establish a sound, well-balanced investment list.

Our Consultation Service offers you:

1. A review of your securities every three months, with recommendations for sales and purchases.
2. Continuing watchfulness by our organization for developments affecting your stocks and bonds and, when desirable, suggestions for changes.
3. Consultation with us in regard to your investments at any time.

Our officers will be glad to explain this service to you in detail.

The

New England Trust Company

135 DEVONSHIRE STREET

*At the Corner of Milk Street
BOSTON 7, MASS.*

Member Federal Reserve System

SYSKA & HENNESSY, INC.

Engineers



DESIGN • CONSULTATION • REPORTS

POWER PLANT • WASTE DISPOSAL • WATER SYSTEMS

New York City

OPERATIONS RESEARCH

(Concluded from page 396)

Aid to Administration

Perhaps it can be seen by now that such methods can probably not be used to solve all problems. It is quite unlikely that the methods of analysis used so successfully in genetics can be used to solve all biological problems, or that the operations research scientist, with his specialized techniques of analysis, can ever replace the usual business executives or army generals, with their practical experience and their intuitive grasp of the complicated effects of morale and applied psychology, for example.

But as the techniques of physical science are tried in more and more different fields, it should become clear what situations can be analyzed by its means and what situations cannot. Already there are operations research teams working closely with military and industrial administrators, exploring these possibilities, reporting their findings to the administrator so that he may be able to combine their quantitative results with his experience and judgment to reach more understanding decisions.

Scientists and engineers have not, in general, been active in administering government or business. This is not surprising, for the business of science is to understand, not to act. But in operations research, however, there is an opportunity for scientists and engineers to help in administrative problems, not by becoming the administrator, but by helping the administrator to reach a wise decision, fully conscious of the implications of his choice.

HOLMES & NARVER, INC.

ENGINEERS • CONSTRUCTORS

828 SOUTH FIGUEROA STREET

LOS ANGELES 17
TRINITY 8201

JAMES T. HOLMES
M.I.T. '14

D. LEE NARVER
STANFORD '14

CHAUNCY HALL SCHOOL

Founded 1828. The School that specializes in the preparation of students for the Massachusetts Institute of Technology.

Ray D. Farnsworth, Principal 533 Boylston Street, Boston, Mass.

LEONARD CONSTRUCTION COMPANY

Engineers and Contractors

SINCE 1905

IN THE AMERICAS AND FAR EAST

37 South Wabash Ave.

Chicago

LICENSING ARRANGEMENTS WANTED

We wish to acquire patent rights on electrical components, instruments, or accessories used in the following fields:

RADIO, RADAR, OR TELEVISION. TELEPHONE,
TELEGRAPH, TELETYPE, OR SOUND
ON FILM. PUBLIC UTILITIES. AIRCRAFT.

Our preference is for items that have limited rather than mass markets. We have a particular interest in switches and relays, also in telephone parts and accessories.

All replies to be held confidential. Please write to Box G
Technology Review.

SA-3

N. A. LOUGEE & COMPANY

ENGINEERS AND CONSULTANTS



Reports—Appraisals—Depreciation Studies

Rate Cases—Business and Economic Studies



120 BROADWAY

NEW YORK 5, N.Y.

N. A. LOUGEE '11 L. A. MATTHEWS '13
J. W. McDONALD, Jr. '20 B. F. THOMAS, Jr. '13
E. S. WEST '40

J. C. CORRIGAN CO., INC.

Conveyors

ENGINEERS • MANUFACTURERS • ERECTORS

•
Coal Handling Systems
Material Handling and Processing Equipment
Portable Conveyors

•
Distributors for
Jeffrey Manufacturing Co.
41 Norwood Street, Boston 22, Mass.
Tel. GENEva 6-0800

PROFESSIONAL CARDS

JACKSON & MORELAND *Engineers and Consultants*

Design and Supervision of Construction Reports — Examinations — Appraisals Machine design — Technical Publications

BOSTON

NEW YORK

JAMES F DOWNEY *CONSULTING ENGINEER*

INDUSTRIAL ORGANIZATION, PLANT LAYOUT, LABOR MEASUREMENT, JOB EVALUATION, PLANNING & SCHEDULING, MATERIAL CONTROL, BUDGET & COST CONTROL, LABOR RELATIONS

20 North Broadway

White Plains, N.Y.

EADIE, FREUND AND CAMPBELL *CONSULTING ENGINEERS*

500 FIFTH AVENUE NEW YORK 36, N. Y.
Mechanical — Electrical — Sanitary
Air Conditioning — Power — Process Layouts

J. K. Campbell, M.I.T. '11

STARKWEATHER ENGINEERING CO. *INCORPORATED*

Engineers and Contractors for Pumping Plants
Boiler and Power Plants, Cooling Water
and Heat Recovery Systems

246 Walnut Street, Newtonville BI 4-8042
J. B. Starkweather, B.S. M.I.T. '21

THE KULJIAN CORPORATION Consultants • Engineers • Constructors UTILITY • INDUSTRIAL • CHEMICAL

1200 N. Broad St., Phila. 21, Pa.

MEXICO CITY • CARACAS • MADRID • ROME • ATHENS • TOKYO
• CALCUTTA •

H. A. Kuljian '19

A. H. Kuljian '48

FABRIC RESEARCH LABORATORIES *Incorporated*

Research, Development and Consultation
for Textile and Allied Industries

665 Boylston Street Boston, Mass.
W. J. HAMBURGER, '21 K. R. Fox, '40 E. R. KASWELL, '39

GILBERT ASSOCIATES, INC.

ENGINEERS AND CONSULTANTS

Malcolm G. Davis '25, Vice President Allen W. Reid '12 E. C. Edgar '35
Steam, Hydro, Diesel Power Plants; Industrial Structures; Plant Safety, Labor Relations, Utility Rates, Valuations, Reports; Large Scale Purchasing; Industrial Laboratory New York, N. Y. Reading, Pa. Washington, D. C. Philadelphia, Pa. Houston, Tex.

FAY, SPOFFORD & THORNDIKE *Engineers*

Airports — Bridges — Water Supply and Sewerage Port and Terminal Works — Fire Prevention

INVESTIGATIONS SUPERVISION OF CONSTRUCTION
BOSTON NEW YORK

CLEVERDON, VARNEY & PIKE *Consulting Engineers*

HERBERT S. CLEVERDON '10 WALDO F. PIKE '15
Structural Designs Foundations
Heating Ventilating and Plumbing Designs
Industrial Buildings, Reports, Investigations

120 TREMONT STREET BOSTON 8, MASS.

MAURICE A. REIDY *Consulting Engineer*

BRIDGES BUILDINGS
STRUCTURAL DESIGNS FOUNDATIONS
CONSTRUCTION CONSULTANT AND ARCHITECTURAL ENGINEER
Estimates and Appraisals

101 TREMONT STREET BOSTON, MASS.

CHARLES NELSON DEBES AND ASSOCIATES *ENGINEERS AND CONSULTANTS*

Plant Layout — Electrical — Mechanical
Structural — Sanitary — Acoustical

ROCKFORD TRUST BLDG. ROCKFORD, ILL.
C. N. DEBES '35

MORAN, PROCTOR, MUESER & RUTLEDGE *CONSULTING ENGINEERS*

Foundations for Buildings, Bridges and Dams;
Tunnels, Bulkheads, Marine Structures, Soil Studies and Tests; Reports, Design and Supervision

WILLIAM H. MUESER '22 PHILIP C. RUTLEDGE '33

CHARLES A. MAGUIRE & ASSOCIATES

ENGINEERS

PROVIDENCE BOSTON

Cohasset 4-1020 Hingham 6-2360

FRANK MASSA *Electro-Acoustic Consultant*

373 Atlantic Avenue 5 Fottler Road
Cohasset, Massachusetts Hingham, Massachusetts

weaving facts



With each new fibre comes an opportunity to builders of textile machinery. The Draper XD Loom is a model of versatility, primarily designed for weaving filament rayon and acetate. It now handles equally well newer science fibres, either filament or staple.

Nylon, dacron, orlon or acrilan fit this loom

like a glove. A wide range of other fabrics, even including blends which require filling mixing, can also be woven.

By enabling one weaver to run as many as 80 looms, with speeds up to 192 picks per minute, the XD Model provides the answer to high production and top quality weaving.

Draper Looms Produce More Cloth at Less Cost Throughout the World.

DRAPER CORPORATION

ATLANTA, GA.

HOPEDALE, MASS.

SPARTANBURG, S. C.



Alumni AND Officers IN THE News

Honored Alumni

ERNEST BOYD MACNAUGHTON'02 was awarded an honorary LL.D. degree (*honoris causa*) by Reed College on March 21.

J. HOWARD CATHER'12, superintendent of the power division at Kodak Park, has been elected to life membership in the American Society of Refrigerating Engineers.

MERTON P. LAMDEN'47 has received a grant-in-aid of \$1,000.00 from Hoffman LaRoche, Inc. Dr. Lamden, Assistant Professor of biochemistry in the University of Vermont College of Medicine, will use the grant for a research project under the title "The Role of Ascorbic Acid in Oxalate Formation."

WILBERT E. CHOPE'49 was named "Outstanding Young Man of 1952" by the Columbus, Ohio, Junior Chamber of Commerce. Mr. Chope, President of the Industrial Nucleonics Corporation, was cited for achievement in the industrial application of nuclear physics.

MARSHALL FIXMAN, staff, research assistant, has been awarded a Frank B. Jewett post-doctoral fellowship for 1953-1954 by Bell Telephone Laboratories.

Elections and Promotions

PHILIP B. STANLEY'06 has been appointed a member of the State Investment Committee of Connecticut.

JOHN R. FREEMAN, JR.,'16 has been appointed vice-president of metallurgy and research of The American Brass Company. The appointment was made on March 3.

HORATIO L. BOND'23, chief engineer of the National Fire Protection Association has been named president of the Alumni Association for a term to begin in July. His service to M.I.T. includes being a member of the Alumni Council and Alumni Fund Board, secretary of the Class of 1923 and previous service as a member of the executive committee and as vice-president of the Alumni Association.

SAMUEL S. AUCHINCLOSS'27 was recently elected president of De Walt, Inc., in Lancaster, Pa.

LOUIS F. EATON'27, division manager of the Blackstone Valley Gas and Electric Company has resigned to accept the position of operating vice-president of the Brockton Edison Company. Mr. Eaton assumed the duties of his new post on March 2.

FRED HOLT, JR.,'30 was elected vice-president of Brown-Bridge Mills in March.

HOYT P. STEELE'34, President in charge of engineering and research of the Benjamin Electric Manufacturing Company, Des Plaines, Ill., has been named vice-president of the National Electrical Manufacturers Association.

ROBERT S. GILLETTE'36 was elected executive vice-president and general manager of the Rock of Ages Corporation, in Barre, Vt.

CHARLES ALEXANDER BLESSING'37 resigned as director of the Chicago City Plan Commission to fill the post of director for the City Plan Commission of Detroit.

ARTHUR B. METZNER'51 was appointed assistant professor of chemical engineering of the University of Delaware's School of Engineering it was announced in January.

Science Bookshelf

GIO GAGLIARDI'25 is the author of an article entitled "Where Obsolete Equipment and Neglect Take Daily Toll in Print Cost and Prestige" which appeared in the January 10, 1953, issue of the Motion Picture *Herald*.

DR. BENJAMIN F. MILLER'28 is the author of an article entitled "Have We Missed a Cure for Cancer?" which was published in the December 13, 1952, issue of *Collier's*.

ERNEST R. KASWELL'39 has written a book entitled *Textile Fibers, Yarns and Fabrics* (New York: Reinhold Publishing Corporation, 1953, \$11.00). It is intended to offer a carefully annotated, interpretative bibliography of textile behavior with special reference to wool.

HENRY AVERY'41, Manager of the Plasticizer Division of the Pittsburgh Coke and Chemical Company, wrote a paper entitled "Plasticizer Volume Continues to Grow." An article based on this report entitled "Plasticizers Set New Records" was published in the September, 1952, issue of *Modern Plastics*.

E. ALFRED PICARDI, 2-44, is the author of an article entitled "How to Apply the Method of Slope Deflection to Thermal Stress Analysis of Piping," which was published in *Petroleum Processing* magazine, March, 1953, issue.

GEORGE DE SANTILLANA, staff, is the author of an article entitled "Straws in the German Wind" which appeared in the March, 1953, issue of the *Atlantic Monthly*.

PHILIP FRANKLIN, staff, wrote a book entitled *Differential and Integral Calculus* (New York: McGraw-Hill Book Company, Inc., February, 1953, \$6.00).

E. B. MILLARD, staff, is the author of a textbook entitled *Physical Chemistry for Colleges, 7th Edition*; (New York: McGraw-Hill Book Company, Inc., April, 1953, \$6.00).

Obituary

- Horace B. Gale'83, December 4.^{*}
George L. French'84, January 23.
Philip S. Morse'84, March 1.
Henry D. Bates'88, March 21.
Lemuel B. Holmes'90, March, 1952.
Mary L. W. Morse'90, October 3.
Howard Gilmore'92, January 15.^{*}
Richard E. Belden'93, date unknown.
T. Clive Davies'94, November.^{*}
George B. Haven'94, March 6.^{*}
William E. Swift, February 28.
Frederick W. Bartlett'96, February 26.
Daniel Moore Bates'96, February 24.^{*}
Emeline E. Torrey'96, May 8, 1949.
Milan V. Ayres'98, February 6.
William W. Rush'98, December 29.
G. Franklin Atkins'99, January 24.^{*}
Arthur E. Blackmer'99, February 21.^{*}
Harold S. Graves'99, June 23.^{*}
Arthur S. Peck'00, May 30, 1952.^{*}
John R. Anderson'01, December 22.^{*}
Robert L. Kruse'03, February 5.
William S. Anthony'04, March.^{*}
S. Henry Ayers'05, November 17, 1951.
Roland Bendann'05, September 20.^{*}
Alberto W. Small'05, January 19.^{*}
Everett F. Tomlinson'06, March 14.^{*}
Henry J. Kent'07, January 15.^{*}
George W. Everett'08, November 7.
Ernest E. Kilburn'08, March 6.^{*}
Laurence S. Winchester'09, December 15, 1951.^{*}
Frank N. Phelps'13, February 13.
William S. Conner'14, June 1.
Albert R. Losh'14, December 26.^{*}
Arthur R. Stubbs'14, March 10.^{*}
Lyle K. Webber'14, January 7.^{*}
Kshitish C. Basu'15, date unknown.
Edmond Spencer'17, January 27.
Everett D. Wells'17, August 13.
Louis E. Wyman'17, March 20.
R. Ranney Adams'18, January 16.^{*}
Albert E. Povah'21, March 6.^{*}
George R. Prout'22, March 8.^{*}
Myrtle R. Peck'25, January 21.^{*}
Horace M. Bush'26, March 14.
Charles J. Cristofolo'28, January 31.
Dr. Marius M. Agresti'29, January 4.
Alexis A. Berestneff'30, November.^{*}
Henry K. Dick'30, January 7.
Everett J. Felker'30, September, 1945.^{*}
Fred R. Huntington'30, December.^{*}
Nandal M. Shah'30, December, 1951.^{*}
William J. Murphy'32, November 18, 1949.
J. Conrad Huddle'42, June 24.
Thomas B. Bishop'51, March 9.^{*}
David F. Schmitt'51, January 25.

* Mentioned in class notes.

News FROM THE Clubs AND Classes

CLUB NOTES

M.I.T. Boston Luncheon Club

At its March 19 meeting, 72 members and guests, including half a dozen co-eds, heard Charles P. Kindleberger, Professor in the Economics Department, discuss the outlook for foreign trade under the Republican Administration. He pointed out that our tariff heritage grew up largely to protect infant industries from outside competition, that is, textiles in the early 1800's, dyes and drugs after World War I, and so on. Our position in many industries today, particularly those where capital investments are heavy, and labor cost relatively low, has practically reversed itself.

A large number of our industries and an important segment of agriculture are exporters, and organized labor is relatively more powerful in the export industries, such as automobile, steel, and so on, so that we may expect a responsive Administration to lean more toward lower tariffs, and extension and broadening of the Reciprocal Trade Agreement Act. This would bring about a transposition of the historical low traffic position of the Democratic Party and high tariff position of the Republicans.

The path for the Republicans, however, is neither clear nor smooth, as the oil industry, for example, may be expected to resist importation of oil from the Near and Middle East, and the high labor industries, such as cheese, glass, gloves, hats, and so on, and inefficient units of the textile industry, can be counted on to hold out for present, or even higher, tariffs. — CHENERY SALMON'26, *Secretary*, The Merchants National Bank, Securities Analysis Department, 28 State Street, Boston, Mass.

M.I.T. Club of Cuba

On the evening of January 27 the M.I.T. Alumni of Cuba gathered for dinner at the Havana Country Club to greet President and Mrs. James R. Killian, Jr., who were the guests of honor, and to meet Robert S. Harris'28, of the Food Technology Department, with Mrs. Harris, and Mr. and Mrs. Gilbert Smith, of the Foundation for Medical Investigations of Cuba.

Dr. Killian'26 came to Havana on a double-purpose visit: to meet with the Alumni in Cuba and to be present at the official inauguration of the food laboratory established by Dr. Harris as technical consultant for the recently organized Foundation for Medical Investigations. From Havana, Dr. and Mrs. Killian would fly to Mexico City to participate in the big "Fiesta in Mexico" organized by the Mexican Alumni.

Mr. Gustavo Calleja'43, President of the Club acting as toastmaster, welcomed

and introduced Dr. Killian, who gave a very interesting and pleasant speech on the progress made by the Institute in recent years and on present-day student life on the Institute campus. Dr. Harris spoke on the work to be done in the new laboratory recently inaugurated to investigate the nutritional value of local foods. Mrs. Smith, a distinguished member of the new Foundation, requested the co-operation of M.I.T. Alumni in her organization. Mr. A. Helier Rodríguez'21, Honorary Secretary, said a few words of gratefulness to Dr. Killian for having come to attend a meeting of the Cuban Alumni.

Those in attendance were: Mr. and Mrs. Oscar Alonso'41, Mr. and Mrs. Antonio Badia'43, Mr. Alfredo Blanco'41, Mr. and Mrs. Juan Chibás'31, Mr. Gustavo Calleja'43, Mrs. Esther Galainena, Mr. and Mrs. Cruz Bustillo'32, Mr. and Mrs. Manuel Cadenas, 6-45, Mr. Victor Carmona'43, Mr. and Mrs. Gonzalo Docal '44, Mr. and Mrs. Jorge Echarte'40, Mr. and Mrs. Hector Hoyo'38, Mr. Solomon Heisler'48, Mr. Rafael Laredo'44, Mr. and Mrs. Federico Linder'48, Mr. and Mrs. Justo L. Michelena'25, Mr. Ignacio Mora'47, Mrs. Nina Perera Collier'34, Mr. José L. Marques'49, Mr. Rolando Martínez'08, Mr. and Mrs. Juan Navia'50, Mr. and Mrs. Alfred Pedraza'41, Mr. Enrique Rodríguez'51, Mr. and Mrs. A. Heiler Rodríguez'21, Mr. and Mrs. Antonio Rosado '24, Mr. and Mrs. Fred C. Randall'02, Mr. Luis A. Suárez'48, Mr. and Mrs. Julio Ulloa'33, Mr. and Mrs. Modesto Ulloa'32, Mr. Jaime Urrea'51, Mr. Francisco Vázquez'44, Miss Silva, Mr. and Mrs. Alberto Villamil'42, Mr. and Mrs. José A. Villamil '38, Mr. and Mrs. Gaspar Vizoso'31 — ANTONIO H. RODRIGUEZ'21, *Review Secretary*, Concordia 61, Havana, Cuba.

M.I.T. Club of Fort Worth

The Club met with a dinner at Western Hills Hotel on March 11, 1953, with the wives of the members as guests. The following officers were elected for the coming year: President — S. E. Travis, Jr., '21, Vice-President — Norman B. Robbins'37, Secretary-Treasurer — Ralph R. Uhramacher'31.

Thomas Harriman'43, Assistant Chief Engineer of Bell Aircraft Corporation, Helicopter Division, gave a very interesting discussion, with colored slides, of his recent trip to Korea, showing the use of helicopters for the evacuation of wounded. — C. KEITH BEYETTE'33, *Secretary*, 2304 Stratford Court, Fort Worth 3, Texas.

M.I.T. Club of Guatemala

The 89th M.I.T. Alumni Club was formed on February 12, 1953, with great enthusiasm among the Technology Alumni of Guatemala City, Central America.

This meeting was held in the pleasant surroundings of El Patio Restaurant with H. E. Lobdell'17 present as guest. The officers of the new Club are Rodolfo An-

drade'52, President, 6 3A Calle de Tivoli, Guatemala City, Guatemala; EDUARDO F. HERRERIAS'43, *Secretary-Treasurer*, 11 Calle P 5 Guatemala City, Guatemala.

M.I.T. Club of Hartford

The Club held its second regular meeting of the 1952-1953 year on February 18, at the Hedges Restaurant, New Britain. There were present 27 members and 16 guests including Thomas F. Malone'46, Associate Professor of Meteorology at M.I.T. Professor Malone delivered a very interesting talk on the general subject "Climatology and our Daily Lives." The group also enjoyed seeing the new R.K.O. Pathé movie entitled *Men of Science*.

Plans for the April meeting include a field trip to the new Brainard Field Terminal and the Hamilton Standard Plant. — CHARLES P. BRITTON'33, *Secretary*, 15 Lewis Street, Hartford, Conn.

M.I.T. Club of The Miami Valley

The Club met February 26 at the Dayton Y.M.C.A. for dinner and a program of sound movies highlighted by *Men of Science*, the new R.K.O. Pathé short on M.I.T. A color movie, *The Questing Mind*, about General Motors Research Laboratories was thoroughly enjoyed; also, we were indebted to General Motors for our third film on the subject of time and motion study.

During film changes there was lively discussion of the Educational Council Program and the Sloan Fellowships and School For Industrial Management. We were fortunate to have Bill Anderson'52 of Frigidaire present to add his comments on the Management School, as he was a member of this select group last year. The group had a good chuckle when Bill's "mug" showed up in the M.I.T. movie during a shot of Alfred P. Sloan conducting a seminar. We've got Bill's promise to spend an evening telling us more about the Management School.

Among the 23 men present were Arthur R. Harvey'21 and Charles W. Denny, Jr., '29, who came up from Middletown. Ten of the group were from the Army Air Corps at Wright-Patterson Air Base in both civilian and military capacities. Four represented General Motors. Our mailing list contains 230 names spreading out to Springfield, Troy and Middletown. — EDWARD E. BARNEY'42, *Secretary*, 1720 Academy Place, Dayton 6, Ohio.

M.I.T. Club of Northern New Jersey

Officers and committee chairmen met on February 17 at Hotel Suburban, East Orange, to develop plans for remainder of the year. Ladies' Night, April 8, was the main topic with reports on program and hotel arrangements. Also discussed were plans for June 2 when the Club's Annual Meeting will be held in Summit (Hotel Suburban). To this last meeting of the year which will have the co-themes

of M.I.T. and new developments in science, will be invited all area applicants for admission to Technology next fall, continuing last year's successful innovation aimed at giving prospective Tech men a chance to rub shoulders with Tech Alumni and thereby acquire a vicarious Tech experience.

President Paulsen'40 announced appointment of a Nominating Committee: Lyman L. Tremaine'23 (Chairman), Russell E. Lowe'16, Newton S. Foster'28, Peter B. Baker'50, Clarence Van C. Chamberlin'23. Also appointed was a special committee to study costs and finances: Joseph Wenick'21 (Chairman), W. Bennett Sharp, Jr., '36, Stuart G. Stearns'39, Russell P. Westerhoff'27, A. Donald Green'26, Clarence Van C. Chamberlin'23.

It was voted that the Educational Council should become a regular Club activity, and it was reported that the Council, which had held a meeting earlier in the month, now consisted of 30 honorary secretaries and 26 councilors. — RUSSELL P. WESTERHOFF'27, *Secretary*, 823 East 23rd Street, Paterson, N.J. JACK F. ANDREWS'33, *Assistant Secretary*, 209 Tuttle Parkway, Westfield, N.J.

M.I.T. Club of Puget Sound

More than 170 Technology Alumni, their wives and parents of students now attending M.I.T. attended a President's Night dinner program in Seattle honoring Dr. James R. Killian, Jr., '26, and Julius A. Stratton'23. The affair was held at the Seattle Tennis Club. Horace W. McCurdy'22, President of the Puget Sound Bridge and Dredging Company, served as master of ceremonies and introduced the honor guests Dr. Henry Schmitz, President of the University of Washington, and Mrs. Schmitz; Samuel E. Fleming, Superintendent of Seattle public schools and Mrs. Fleming; Dr. Robert E. McConnell, President of Central Washington College of Education, Ellensburg; and the principal speakers, Drs. Killian and Stratton. Dr. Stratton spoke on the subject "The New Freshman Year at M.I.T." Dr. Killian's subject was "Education Can Be Human." The dinner was preceded by a social hour. The President's Night dinner program arrangements were made under the general chairmanship of Jack Samuelson'40, assisted by Program Chairman Russell E. Winslow'40, Finance Chairman H. Merritt Woodward'39 and Publicity Chairman J. W. Barton'39. The parents of more than 15 students now attending M.I.T. were present.

All those present were greatly pleased by Dr. Killian's anecdotes of student life at M.I.T. and by reminiscences of Seattle boyhood by Dr. Stratton, a native of Seattle, as well as by more serious remarks of both concerning broadening the approach to technical education. — J. W. BARTON, *Secretary*, 4038 Hunts Point Road, Bellevue, Wash.

M.I.T. Club of South Florida

On February 15, 1953, the Club held a meeting at the Country Club in Coral Gables. The purpose of the meeting was to reorganize the Club into an effective group, to redefine the objectives of the Club, and to stimulate the membership into more active participation in the

Club's affairs. A new slate of officers were elected: Richard L. O'Donovan'27 — President; Fred E. Mason'29 — Vice-president; Ralph C. Robinson'01 — Vice-president; Robert Nedbor'37 — Vice-president; Charles S. Symonds'35 — Vice-president; William Sussman'40 — Treasurer.

A new type of program was unanimously adopted by the Club's Executive Committee at a meeting on March 3. It was decided to have three types of meetings, Business, Social, and Professional and to hold four of each type throughout the year. A form card asking for information about each member has been mailed and these will be used to print a Club Directory, the purpose of which is to better acquaint the members with each other and to serve the Program Committee with talent data.

President O'Donovan has divided the membership into four different districts, Miami, Miami Beach, Coral Gables and Fort Lauderdale. District Committeemen in each of these areas will serve as liaison between the members and the Executive Committee. It is felt that this will make the Club more effective by closer and more personal contact with each member.

The various committees appointed by President O'Donovan are as follows: District Committee: Miami — C. P. Thayer'23; Miami Beach — Edward I. Mandell'21; Coral Gables — George E. Batcheller'10; Fort Lauderdale — Ralph C. Robinson'03; Program Committee — Charles S. Symonds'35, chairman: Donald S. Whitmore'51; Colonel Cecil G. Young'23; Gebhard G. Rockerman'47; Membership Committee — Fred E. Mason'29, chairman: Thomas E. Mattson'24; Scott J. Hoehn'47; Robert Nedbor'37; Constitution and History — C. P. Thayer'23; Student Activities — James L. Newmeyer'43, chairman: Edward I. Mandell'21; Liaison — William Sussman'40, chairman: Charles E. Poore'26; Alexis B. Kononoff'29; Publicity — William Sussman'40. — CHARLES S. SYMONDS'35, *Secretary*, 8251 S.W. 52nd Street, Miami 43, Fla.

M.I.T. Club of Southern California

The year 1953 promises to be one of great progress in this Club, and by the time this is read the meeting of the presidents of M.I.T. and of Cal Tech and their administrative assistants will be history, and from the standpoint of advance in technical leadership in the United States it is an historic event. The co-operation of these two leading institutions may lead to similar actions in other fields of education.

In advance, may we welcome to our meeting of March 25 President James R. Killian, Jr., '26, Vice-president Julius A. Stratton'23 and faculty leaders Belluschi, Cochrane, and Gilliland.

Another development in this area is the proposed establishment of branch clubs in San Diego, Santa Barbara and any other locality where there are enough Tech men to carry on meetings, which may be monthly luncheons, semiannual dinners, or when it is possible for the speaker at the Los Angeles meeting to spend another day at low expense to the Institute in one of these places.

Secretary Herrick'24 has furnished George Cunningham'27 with a list of the Alumni in San Diego and vicinity, and if there are some sparks of interest, a couple of car loads of loyal Alumni will drive down and endeavor to help the San Diego area Alumni get into gear, and momentum. Herrick's address is care of Mead Johnson, 3450 Wilshire Boulevard (5); Phone DU-89671 — their business having increased under Phil's management so as to require a new location.

Further news of these new foci of Tech spirit will appear in subsequent notes.

The governors' meeting of February 18 at the Elks Club welcomed Arthur B. Marlow'29 returning from long service in South America. The get-together of M.I.T. Alumni at Mike Lymans, 8th and Hill, on March 16 saw Henry Lee'47, Associate Editor of *Scalacs* — the chemical engineers' magazine for this area. The reason for mentioning the association of these two is that both phoned and volunteered to be active in the Club. This is greatly appreciated by our genial president, MacCallum'24 as he, Cunningham, Hiller'31, Herrick, Cullison'41 and past president Hereford'24 have been very busy with the many meetings of the past six months and the preparation of the slate of the new officers.

The following should be cut out and placed in each alumnus's note book: President William H. MacCallum'24; Membership Chairman George M. Cunningham'27; Program Chairman Robert E. Hiller'31; Secretary Phillip A. Herrick'24; Treasures James S. Cullison'41; Assistant Secretary Henry Paronelli'35. MacCallum is the heart of Modern Talking Picture Service, 612 South Flower Street, 17, phone Ma 9-2121, and is forever lifting.

MacCallum appeared at the American Chemical Society's annual meeting to welcome around 20 M.I.T. Alumni from various states. Many more of the Alumni could not be at the social hour as they with Cunningham (in charge of Publicity for the entire Chemical Society meeting) could not return from the Torrance trip until after 6:00 p.m. Beebe'10, Morton'13 Bates'24, Lee and Goldstein'47 and Andreas'37 also attended from the local club, and it is regretted that a list was not taken of those from outside, which included three charming wives.

The finances of the club are running on an even keel — keeping intact the backlog produced from the 1951 directory. All Alumni are urged to send their dues now to Treasurer Hiller, care of Triplett and Barton at Burbank, and to include something for the "kitty." The forward and constructive views of the Club will increase, and the views and help of each individual alumnus is welcomed. — HIRAM E. BEEBE'10, *Review Correspondent*, 1847 North Wilcox Avenue, Hollywood 28, Calif.

CLASS NOTES

• 1883 •

Mrs. Horace B. Gale has asked the Review Editors to publish the following

obituary of Mr. Horace B. Gale, former Class Secretary of 1883. The notice is from the December 4, 1952, Boston, Mass., *Herald*. "Horace B. Gale, 91, an electrical engineer, former state representative and town official, died today at his home."

"Active in town and civic affairs for many years, Mr. Gale was chairman of the Morse Institute Library and was a former member of the town planning board, school committee and board of appeals. While chairman of the town planning board, he wrote Natick's first building code and zoning laws. He formerly was president of the State Federation of Planning Boards. He served in the Legislature from 1898 to 1902.

"Born in Natick, he was graduated from Massachusetts Institute of Technology in 1883. He did pioneer work in electric lighting in Boston and for many years engaged in experimental work at the Submarine Signal Company in Boston. He then was a consultant engineer for the Simplex Electric Heating Company until his retirement about 1920.

"He was a member of the Rotary Club and a former member of the University Club and Engineers Club.

"He leaves his wife. Funeral services will be held Saturday at 2:00 p.m. from his home. Burial will be in Dell Park cemetery."

• 1890 •

Within the past two months notices of the death of Mary L. W. Morse on October 3, 1952, and of Lemuel B. Holmes in March, 1952, have been received. Neither of these were graduates, and we have very little knowledge of their lives and accomplishments. Miss Morse, born in Poland, Ohio, November 27, 1859, was probably the oldest member of the Class, having almost reached the age of 93. Our records indicate that she lived for a considerable time in Baltimore, but returned to Poland in 1942, remaining until 1946 when she went to Youngstown, Ohio, but apparently returned to Poland before her death.

Charles Sherman writes that, like himself and Will Curtis, Lem Holmes went into Boston from Kingston, on the Old Colony Line, returning in the afternoon, and he thinks Holmes may not have continued for the entire first year. For some time Holmes appeared on our records as being with the firm of Linscott, Tyler and Wilson of Rochester, N.H., but the firm went out of business in 1932. He continued to live in Rochester up to the time of his death. — GEORGE A. PACKARD, *Secretary*, 53 State Street, Boston 9, Mass. CHARLES W. SHERMAN, *Assistant Secretary*, 16 Myrtle Street, Belmont 78, Mass.

• 1892 •

The Secretary has just learned of the passing of another classmate, Howard Gilmore, at his home 97 Holland Road, Brookline, Mass., on January 15.

Gilmore entered M.I.T. with us in 1888, graduated in Mechanical Engineering in 1892, and remained for another year to graduate in Electrical Engineering in 1893.

Shortly after graduation he went into the electrical supply business and established the Gilmore Electric Company,

manufacturers of incandescent lamps and electrical specialties, in Dorchester, Mass. Retiring from business about 1915 he established a home in Brookline, Mass., where he lived for the remainder of his life, devoting a number of years to his hobby of raising chickens after his retirement.

His classmates in Mechanical Engineering will remember him as an able student, and genial companion, and a good friend.

The Secretary hopes that as many as may be able to will join us at the Alumni Reunion this coming June. — CHARLES E. FULLER, *Secretary*, Box 144, Wellesley 81, Mass.

• 1894 •

As these notes go to The Review, the saddening information has just been received of the death of Theophilus Clive Davies at his home, The Old Vicarage, Hawksley, Liss, Hants, England, on an unspecified date in November, 1952. The Secretary may be able to give further information in a later issue.

With deep regret the Secretary also reports the death of our classmate, George Bartholomew Haven, which occurred at his home at Laconia, N.H., on March 6, following a long illness. Widely known as a leader in the design of textile and other machinery, and as the author of many articles and several books dealing with machine design, he had also served as consultant to several firms, especially those engaged in the manufacture of textile machinery.

Haven was born on April 28, 1871, at Saugerville, N.Y., and entered the Institute in 1890. He pursued the Course in Mechanical Engineering with distinction, and on graduation in 1894 received appointment as an assistant in that department, and two years later as instructor. He was promoted to Assistant Professor in 1905, Associate Professor in 1910, and Professor in 1914. He was an excellent lecturer and a very competent and successful teacher both with undergraduate and advanced students. In 1929 he was made professor of advanced machine design and head of the division of textile research. In 1936 he retired as Emeritus Professor. He was a member of the American Society of Mechanical Engineers and of the American Society for Testing Materials in which he was especially active. He was also a member of the United States Institute for Textile Research. In 1932 he received the silver medal of the National Association of Cotton Manufacturers for distinguished achievements and contributions to the textile industry.

In 1898 Haven married Miss Margaret Cushman, and a son and a daughter were born to them. About 1915 they acquired a summer home on the shore of Lake Winnipesaukee, and this has been the family home since 1932.

Classmates will remember Haven as a tall, large man with ruddy complexion and serious demeanor. Deeply religious from the time of his youth, he taught men's classes in Sunday schools, and during most of his Institute days was an active member of the Park Street Church in Boston. Unfortunately for him and for the

Class, he never established warm bonds of fellowship with his classmates, and never attended class dinners, reunions, or the meetings of Alumni, which might have given him many more repaying friendships; nevertheless, he commanded respect of his colleagues and students for his ability as an engineer and teacher, and for his inventive mind.

During recent years, he had suffered much from arthritis or rheumatic trouble, but in spite of this physical handicap and although confined to a wheelchair, he bravely traveled to visit companies at distant points which sought his services as a consultant. He is survived by his wife, a son, Richard W., of Gilford, N.H., and a daughter, Mrs. Elizabeth H. Lathrop, who resides in Mexico. To them the warm sympathy of the Class is extended.

Two very recent papers by Charley Abbot have come to the Secretary's desk and show that he is still most productive in establishing data with reference to cyclical temperature and weather changes in Washington — a series of observations which he has carefully followed for many years. He is now able to make long-range prediction of the weather in that city with a high degree of accuracy.

Walter Batson and his wife have recently found it desirable and advisable to relieve themselves of the cares of maintaining a sizable house and have wisely resorted to a simpler and less demanding method of homekeeping. They have accordingly sold their house and furnishings in Newton Centre and have established themselves in comfortable quarters at 155 Hunnewell Avenue, Newton 58.

In October and November of last year, Walter was obliged to spend several weeks in the hospital and undergo an operation. He reports that he is now gaining strength, and feels sure the change in mode of living will keep them going happily a few years longer. May they have as many as they wish!

Herbert E. Johnson reports that his address is still 828 West 8th Street, Corona, Calif., but failed to indicate whether he is still active in engineering or living in ease and retirement in this pleasant suburb of Los Angeles.

It's a pleasure to report that Alan Clafin is again improved in health. All will deeply sympathize with him in the sudden death on March 5 of his brilliant sister, Miss Edith Frances Clafin, a special lecturer at Columbia University and a noted scholar in medieval Latin and comparative Indo-European linguistics.

The Secretary and his wife had recently planned a three-weeks work and pleasure visit to Florida, but on the day preceding the planned departure to the land of sunshine, the Secretary was conducted to the Homberg Infirmary instead. A five-day stay was efficacious in restoring him so that he is carrying on his usual pursuits. Of course, he is looking forward with special interest to the great convention of the Institute of Food Technologists in Boston in June, culminating in the dedication of the Dorrance Building—the new home of the departments of Biology and Food Technology in which his scientific career was centered for many years. — SAMUEL C. PRESCOTT, *Secretary*, Room 5-213, M.I.T., Cambridge 39, Mass.

• 1895 •

Your Secretary has taken courage since receiving a long interesting letter from an old friend and mate, Latimer W. Ballou. It qualifies supremely on the basis of "a prayer of forgiveness" for "sins of omission" in the past, but includes a splendid biographical sketch of his life and doings, and this adds greatly to the files of the Secretary. He advised that he is now retired from active bank service and living at his old address - 75 Harris Avenue, Woonsocket, R.I. - with his unmarried son, Henry, and that he always has lived in Woonsocket. Factually, Lat is 38 days younger than your Secretary and is planning to conserve his strength to meet at our 60th Class Reunion, in 1955. He has also qualified in developing his generation in having four great-grandchildren.

We also received an interesting letter from Gerard Matthes. While Gerard has retired from many active years of service with our government, he continues to be active as consulting hydraulic engineer, and finds consulting work for our neighbors in Mexico and Colombia interesting and worthwhile, which provides friendly contacts with the officials in these southern countries. He chided me somewhat on the fact that I could not report any great-grandchildren, at the time I mentioned the event of my Golden Wedding Anniversary. He brags of his record of having three great-grandchildren. He has one grandson in Korea, his third year in the Navy on an airplane carrier. Mr. and Mrs. Matthes are looking forward to March 3, 1954, when they hope to celebrate their 50th Golden Anniversary, in the golden west of Arizona, where this "fast accumulating" family make their home. We sincerely hope they realize this fond expectation.

While writing the above notes at the "eleventh" hour, the postman delivered two additional letters from '95 men. One came from Walter A. Hall, Samoset Road, Eastham, Mass., and the other from Gerard Swope. The fact that your Secretary took the occasion to report his birthday and his wedding anniversary, has apparently stirred some of our mates to thinking and to reporting such outstanding events in their lives.

Walter Hall states he celebrated his 50th Wedding Anniversary on January 7, 1953, the coincident date of your Secretary's happening, and also the date of Hall's birthday at the age of 79. The Halls contemplate extending their celebration by a month of auto trips, especially to Pompano Beach, Fla., returning by routes not formerly traversed. Gerard Swope's letter is very interesting, and I quote: "Mrs. Swope and I have just returned from a lovely trip to Hawaii, where we swam every day in the broad Pacific. The water was 70 degrees and the air 71 degrees, with sunshine every day and all day long. Over there the days are longer in January than they are here so we fully enjoyed it, and I have encouraged others of my friends here to go there when they seek a lovely pleasant vacation." Gerard also celebrated his 80th birthday last December and his Golden Wedding Anniversary on August 1, 1951. There must be other mates who have retired from active service and still own a pencil or a pen,

who could write of some of their interesting experiences at this time of their lives. Why not? Do it now, and remember you are helping your Secretary to keep "young"! — LUTHER K. YODER, *Secretary*, 69 Pleasant Street, Ayer, Mass.

• 1896 •

The spring get-together of '96 men in and around New York was held at the New York Yacht Club on February 26. Those present were Bakenhus, Dorrance, Stoughton, Trout, Tilley and Rockwell. The luncheon was held in honor of Dr. Rockwell, Class Secretary, and the date was arranged while he was passing through New York City on his way home to Cambridge from Tennessee. It was a great success although sparsely attended. John Tilley and Bakenhus were acting hosts. There was a general discussion of overall subjects and of the Midwinter Alumni Meeting in Cambridge. Question of future alumni meetings was considered. It was felt that from now on it might be better to have an annual dinner during the commencement exercises and omit any larger plan of the 60th reunion. Any suggestions along this line would be greatly appreciated.

William T. Dorrance has been elected an honorary member of the Connecticut Society of Civil Engineers. R. E. Bakenhus has been elected Secretary Emeritus (for life) of the American Institute of Consulting Engineers. He is a past president and past secretary of the Institute. The following letter from Joe Harrington immediately reminds us of his outstanding contribution to "Coal and its Uses." In *Who's Who* in N.A.P.E. we find Joe preparing a fundamental groundwork in preparation of stoker studies and inventions. Your Secretary suggests it might be worth while for some of you to read of some of the successes he has enjoyed. Thank you, Joe, for your contribution: "Just thought you might be interested for a minute or two in looking at the enclosed. I am working regularly four days a week as 'Advisory' engineer — no routine duties but they call on me whenever they run into a sale or trouble job they (sales department) cannot handle. Hope you are well. My best regards to any of the boys you may see."

From Mrs. Edward Mansfield: "Dear Dr. Rockwell: Mother wishes me to thank you for your very kind note of condolence and your interest in publishing a biographical comment in The Review . . . Perhaps of more interest to the readers would be the fact that Dad was manager of the last varsity football team and was class poet in 1896. . . ."

A death notice of Mrs. Julia D. Addison, 265 St. Paul Street, Brookline, Mass., on June 4, 1952, has just been received. It is with deep regret that we announce the death of our classmate Daniel Moore Bates. Our classmate R. E. Bakenhus represented the Class at his funeral. The 1948 edition of *Who's Who* gives the following biographical sketch of Daniel Moore Bates: "Chemical Engineer; born Wilmington, Delaware, April 18, 1876; . . . graduate William Penn Charter School, Philadelphia, post graduate 1892, S.B. in Chemical Engineering M.I.T. (Course X), 1896; . . . married in Ger-

mantown, Pa., May 17, 1902, Bertha Corson Day; children: Bertha, Charles Theodore Russell, Frances Corson, Apprentice Pacific Mills, Lawrence, Mass., 1896-1897; with Jos. Bancroft and Sons Company, bleachers, dyers and finishers of cotton piece goods, Wilmington, Del., in charge of Kentmere plant from 1898; . . . member Board of Directors from 1911; agent (general manager) Lewiston Bleachery and Dye Works, Lewiston, Maine . . . resigned March 1, 1920, and since then member of firm Day and Zimmerman, Inc., Engineers, Philadelphia. Retired from active duty as vice-president in charge of Industrial Management April 1, 1928, but continues as member of Board of Directors . . . Served as Major U.S.A. Ordnance Department, October, 1917 to December, 1918; . . . accepted command as Lieutenant Colonel Field Artillery Officers Reserve Corps, dating from January, 1920; Colonel Field Artillery, O. R. C. from February, 1925. Author: "The Manager's Part" . . . Chairman of Board Cold Spring Bleachery, Yardley, Pa.; Director and Member of Executive Committee of U. S. Finishing Company; Member National Association of Cotton Manufacturers (awarded Association Medal in 1904 for contribution on 'Finishing of Cotton Fabrics'); Member A.S.M.E., Society for the Advancement of Management. Clubs: Rittenhouse, Racquet, Merchants, St. Anthony (New York) Wilmington, Wilmington Country. Independent in politics, Episcopalian." Member of the Delaware Society of Colonial Wars of which he was a former governor. He was also governor general of the national society.

R. E. Bakenhus wrote the following account of the funeral: ". . . I left New York on Monday, March 2, on the 11:30 A.M. train for Wilmington and was met at the station by Mr. J. Sellers Bancroft of the Wilmington Trust Company. As the time of arrival of this train (1:41 P.M.) was over an hour before the time of the services, at 3:00 P.M., Mr. Bancroft very kindly took me to luncheon at the Wilmington Club. Then we walked to St. Andrews Protestant Episcopal Church. There I found I was to be one of the honorary pall bearers. So I was in the group that preceded the coffin in leaving the church. We were taken to the cemetery which was not far away. Here the Rector of St. Andrews Church conducted the usual funeral service.

"Mrs. Bates, the widow, sat in the church across the aisle from the pall bearers. While I saw her there, I did not have a chance to speak to her, nor did I in the cemetery. I intend writing her a letter and hope to send you a copy. She walked with some difficulty and depended on a cane. This, I understand, was the result of the accident they were in while touring. . . . It was an honor to be asked to represent the Class at the funeral of one of its most distinguished members but it was also a very sad duty to perform. There will be no expense from the class treasury as a result of my visit there.

"When I returned to New York I went to the Town Hall Club, to which I belong, for dinner. There I found the usual dancing class going on. Such is life — funerals here and dances there."

Following is the letter Bakenhus wrote to Mrs. Bates: "As a graduate of M.I.T. in 1896, I was selected by our Class Secretary, Dr. John A. Rockwell of Cambridge, Mass., to represent the Class at the funeral of your late husband in Wilmington. It was a very sad duty to perform and yet it was an honor to represent the Class at the funeral services of one of its most able and most distinguished graduates.

"I want to express to you my deepest sympathies. Having lost my wife some six years ago, I can have some realization of the feelings you must have. While I can never get over missing her, I try not to allow my sorrow to overcome me and I find relief in every opportunity that comes to me to do something for others. I hope that I may some day have the opportunity of meeting you." — JOHN A. ROCKWELL, *Secretary*, 24 Garden Street, Cambridge, Mass. FREDERICK W. DAMON, *Assistant Secretary*, Commander Hotel, Cambridge, Mass.

• 1897 •

Recently your Secretary wrote to Jere R. Daniell asking if he would be willing to send to him particulars about the Technology scholarships that he had established some years back, and would he be agreeable to having such details published in the class notes column of The Review. Jere very promptly replied and sent to me the letter which is reproduced herewith: "My father, the Hon. Warren F. Daniell died in June, 1913. He had succeeded his father Jeremiah F. Daniell in the management of the paper mills in Franklin and had carried on successfully in the industry until they were incorporated into the International Paper Company. As father had never had the advantage of even a high school education, I felt it my duty to provide something for Franklin boys that my father had missed, and so in a way, to remember his service to Franklin. In April, 1914, I established the Warren F. Daniell Scholarship for Franklin boys at M.I.T. and fixed the annual amount at \$250.00 per annum which was at that time the Tech tuition fee. At present writing five boys from Franklin have received their degrees from M.I.T., and a sixth graduates this June. Don't know if you would be interested in their names but their years were 1919, 1927, 1934, 1938, 1943. As tuition increased I was able and willing to cover the full cost to these students until 1943. The present beneficiary has G.I. assistance so that I have merely advanced the balance of \$300.00 a year. This year the tuition advances to \$900.00 and in view of this I have now established the annual scholarship aid at \$300.00. All the boys have done well in their various callings and I have been proud of every one of them. It is really a pity that I have not felt able to keep up with the greatly advanced costs of tuition. You are free to use any part of the above as you may wish for The Review. The publicity I won't mind too much. Can stand it, I guess." This establishment of the Warren F. Daniell scholarships for Franklin boys at M.I.T. by Jere is very commendable, honoring as it does his father, the Hon. Warren F. Daniell, the town (or perhaps it is a city) of Franklin and the Massachusetts Institute of Technology. The Class of Ninety-

Seven can indeed take pride in this action of one of its members.

Letters from Proctor Dougherty and George Wadleigh tell of their meeting in Washington and their efforts to round up the other '97 Washington residents for a reunion. They were unsuccessful, however, as Loomis was acquiring a suntan in Florida and Hunnewell was honeymooning in the Caribbean Sea. Herbert Lyman, retired from the Weather Bureau, refused to come out of his hiding place and be counted. Result was that Proctor and George met by themselves where, as Proctor writes, they talked like two teen-aged girls who had not seen each other since the day before. They did get out to see Arthur L. Jennings, who is slowly recovering from a serious illness.

George Wadleigh reports meeting Edward Howard, son of "Than" Howard, in New York at the Engineers Club. He reports his father as being well and at his home in Youngstown, N.Y. Than's wife had a serious illness last summer but is now quite well again. Quoting from George's letter, "Tom Weymouth and I decided to take in the M.I.T. Club Symposium at the Natural History Museum. We foregathered at Tom's delightful apartment, looked over some of Tom's work competing with Rubens and El Greco, then took a taxi to the Museum. The Symposium was interesting, but not nearly so much so as the fact of encountering Frank Shepard of flagpole fame whom we had not seen since our 50th at Osterville. Frank was his old gay self in spite of some bother from arthritis. He's still living at New Rochelle and finds household hobbies sufficient to keep him out of mischief. Frank and I stayed to dinner but Tom had to get back to some diagnosing of the natural gas storage problems. His formula for flow in gas lines is in much use. As for your correspondent, more another time when I will tell you about last summer's trip to the N.W. tall timber country."

In a recent letter Wilfred Bancroft writes: "Recently I had to look something up and got out our *Technique*. After more than half a century I can say that the '97 *Technique* was a darned good job. I hope that you still have your copy. If you have, get it out and give it a good reading. It will renew your youth." Your Secretary followed Wilfred's advice and once started he did not stop until he had reached the back cover. While it did not renew his youth (nothing short of an H-bomb could do that), it did take him back to his undergraduate days with all its pleasures, yes, and all its worries, too. He spent a full hour examining in detail the group photograph taken on the steps of the old Natural History Museum. He found that he could identify, without the aid of the identification key, a large majority of the Class. It was as if he had seen them but yesterday. The hour was late when your Secretary finished reading the book, but he must have one more look at that group picture. His eyes blurred as the memories of 56 years ago came back, and to his mind came the words of the refrain of that old Tech song "On Rogers Steps": "On Rogers steps, what happy memories cheer us,/Of college chums and friendships made to last./Years come and

go but still they seem as near to us./As when we sat on Rogers steps in the golden glorious past." — JOHN A. COLLINS, JR., *Secretary*, 20 Quincy Street, Lawrence, Mass.

• 1899 •

Your Assistant Secretary reports that he received a letter from Burt stating that he was feeling nearly normal again and leaving early in February for St. Petersburg, Fla. He enclosed a notice of the death of Harold S. Graves, Course IV, on June 23, 1952. Mrs. Graves said that she would ask her son, Gilbert, to write something for The Review, but nothing has been received. He was associated for many years with Thomas Byrd Epps, Inc., of Boston in the general practice of architecture. Several years ago he turned his Weston house over to his son and moved to 18 Emerson Street, Brookline.

From Edwin R. Olin '97, notice has been received of the death of Arthur E. Blackmer, Course I, on February 21, in the same house in which he was born, in Plymouth, Mass.

He was a member of the Board of Cemetery Commissioners, the New England Water Works Association and the Plymouth Lodge, A.F. and A.M. Formerly he had been superintendent of the Plymouth Water Works, Town Engineer, superintendent of Roads and Sewers, Selectman and a member of the Planning Board.

Still another death has to be recorded: — that of G. Franklin Atkins, VI, of 410 North Meridian Street, Indianapolis, Ind. on January 24. No further facts are available at this time.

Lewis W. Riddle has moved from 1030 East 49th Street, Chicago, to Harbor Springs, Mich. — BURT R. RICKARDS, *Secretary*, 381 State Street, Albany, N.Y., MILES S. RICHMOND, *Assistant Secretary*, 201 Devonshire Street, Boston, Mass.

• 1900 •

Before these notes are in print, each member of the Class will have received a letter about the reunion to be held at The Pines, Cotuit, Mass., on June 16 to 18, 1953. This is immediately following Alumni Day which will be June 15. It will be a completely informal reunion of members of the Class with their wives, children, grandchildren and guests. There will be no set program but the entire time will be devoted to social activities. This has proved, in previous reunions, to be most satisfactory.

Arrangements for accommodations should be made directly with Mr. C. D. Crawford, Manager. No registration is necessary, but the Secretary will appreciate it if all who expect to attend the reunion will let him know.

Those who have attended any of our reunions at The Pines will appreciate the following item from the Boston *Herald*. "Calvin D. Crawford, treasurer and general manager of The Pines at Cotuit, Mass., was given an award for 'outstanding service to the New England recreation industry' by Laurence F. Whittemore, President of the New England Council. It was given 'in recognition of 40 years of leadership and tireless personal service and sacrifice in the great tasks of obtaining

recognition for recreation as a major source of regional income, of encouraging New England lodging places to upgrade their facilities and in seeking adequate promotional funds on local, state and regional levels."

We have recently learned of the death on May 30, 1952, of Arthur S. Peck. He graduated with us from Course VIII, but we have had no news of him except that he lived in Melrose, Mass. Fred Wilder has returned to Long Beach, Calif., from El Paso, Texas, where he has spent the past six months — ELBERT G. ALLEN, Secretary, 11 Richfield Road, West Newton 65, Mass.

• 1901 •

Thanks to the numerous replies to the Class Letter, I now have plenty of material for these notes for some time to come. However, that does not mean that I do not want to hear from more of you. Those of you who have not sent me anything for a long time, get busy and your news will appear sooner or later.

Dave Cowell has sent me a clipping from the Boston *Herald* of November 23, 1897, which gives an account of the football game and cane rush in our freshman year. I thought that you might be interested in reading this after so many years, so I am giving it to you verbatim. There are some humorous sketches with it which unfortunately cannot be reproduced. "Once a year the officers of station 10 see a big 'scrap' in which they cannot take part, and no matter how much blood is spilt, the minions of the law are forced to stand about as meekly as though they were watching a parade go by on Washington Street. This is when the Tech boys go out to the South end grounds and settle the mooted question of superiority between the freshman and sophomore classes. Yesterday was a perfect day for a football game and cane rush. . . Everybody was in a mood for 'scrapping,' and before the pistol was fired for the cane rush there were numberless little encounters in which there were no losses, except losses of temper. The honors, as has often happened before, were divided between the two classes. The freshmen won the football game after a hard and plucky fight. Then the sophomores, who are on the offensive in the cane rush, made the best showing of hands on the cane at the end of the struggle. At least 500 students took part in the cane rush. . . All the scoring was done in the second half, the freshmen winning 6 to 0. Tech 1901 — Cowing, i.e., Evans, l.t., Le Bosquet, l.g., Laws, c., Gund, r.g., MacDonald, r.t., Dorsey, r.e., Maxson, q.b., Danforth, h.b., Shepard, h.b., Wood, f.b. Tech 1900 — Knight, r.e., Stewart, r.t., Reimer, r.g., Angus c., Babcock, l.g., Jones, l.t., Stevens, l.e., Johnson, q.b., MacPherson, h.b., Priest, h.b., Flanders, f.b. Score — Freshmen 6, Sophomores 0. Touchdown — Shepard. Goal from touchdown — Evans. Umpire — Ulmer, '98. Referee — Locke. Linesmen — Zimmerman, Blake. Time — 20 min. halves. While the football game was in progress, the scrapping began. The sophomores marched in first in a solid body, looking like Falstaff's ragged regiment, clad in sweaters, bloomers, jerseys and all manner of old clothes. They bore a num-

ber of banners with legends calculated to inflame the enemy, but with no very original ideas displayed. Al! was peaceful until the other ragged regiment made its appearance. Then the challenges on the banners were quickly accepted and after a short but telling attack by the freshmen, every sophomore banner was strewn in bits on the grounds. The freshmen had a big black and yellow flag, but when the scrap was over the banner was on its way to a hiding place to adorn later the room of some sophomore. Then the freshmen retired in good order to the other side of the field where they had a German band hired to play the tunes that Noah heard before the flood. Between the halves of the game the sophomores sallied across to pay their respects to the 'babies.' The German band were terror-stricken when the ragged regiment started across toward them and scrambled up on the bleachers and got as close to the fence as the laws of physics would allow them to. The terror of the band inspired the sophomores with a craving to push the musicians of the very old school through the fence or over it. The freshmen formed a loyal phalanx around the band and the musicians kept up their courage by playing as loud as they could, 'There'll be a Hot Time.' The sophomores stormed the bleachers again and again, to be repulsed every time by the youngsters and in the end the fight simmered down to a single-handed encounter like the famous battle of the Horatic and the Curatic, only no Horatic nor Curatic were killed.

When the cane rush became imminent, the sophomores could not wait for the signal. The freshmen formed about the cane and set their faces like flint, waiting for the storm to break. The storm was a little premature and the sophs had to be called back thrice by Ulmer, who was master of ceremonies, so as to make the attack in proper form. The onslaught was made by two wedges with a football player for the tip of each wedge. The sound of the oncoming battalions was like that of a troop of cavalry passing. In an instant bedlam broke loose, and it was nothing but gouge, push, pull and tear until long after the signal to stop was given. The bolder sophs mounted on the shoulders of their classmates to be shot over the crowd into the freshmen mass and disappear, often head first in the midst of the foe. . . When time was called, nearly half an hour was consumed in breaking up the rush. On counting hands, the decision went to the sophomores who had 16 hands on the cane to 13 for their opponents."

Dave Cowell in his Class Letter reply says that although he has retired, he has three jobs. — "Keeping tabs on two grandsons eight and ten years old and that is some work as they are mechanically minded. They want to know why the wheels go round and make things to go round. Railroadiana before 1895 and genealogy. These three hobbies keep me on the go. I belong to the KyLoca and Historical Society. I was 75 on January 7 and have been around railroads for 70 years — running away from home when I was five years old."

I regret to have to report the death of John R. Anderson in Rochester, N.Y. He is listed as a Development Engineer with

the Commercial Controls Corporation of Rochester, N.Y. — THEODORE H. TAFT, Secretary, East Jaffrey, N.H. WILLARD W. DOW Assistant Secretary, 287 Oakland Street, Wellesley Hills 82, Mass.

• 1902 •

The Class seems to have been hibernating through the winter months and very little news has come my way. Seven members, Bassett, Collier, Hall, Hunter, Patch, Philbrick, and Williams, got out to the Midwinter Alumni gathering in early February and had a chance to greet one another, but nothing startling developed. It gave us pleasure to see that Fred was able to be around again after a period of hospitalization.

Dan Patch has received a letter from Lester Hammond who has spent a Sunday with Judson and found him in excellent health and happy to see another '02 man. Lester claims that he and Judson are the only ones in our Class that are permanent residents of Florida. So far as our records show, that is their distinction.

For the benefit of those who did not get a chance to meet Lester last June I will note from his letter — he built a home two years ago on one of the canals in Fort Lauderdale and instead of a car has a 34-foot tied up in his front yard. Although now a resident of Florida, he still spends July and August up on Cape Cod where his family home is, but finds it too cold fore more than the two months. As his construction work has taken him all over the United States, Canada, Newfoundland, and three South American countries, he has had a chance to size up the country. He is now retired but does some consulting work. He would like to have any one passing through look him up, and the same is true with Judson. — BURTON G. PHILBRICK, Secretary, 246 Stuart Street, Boston, Mass.

• 1904 •

A few newspaper clippings have saved the day, otherwise our class notes would be nearly nonexistent. There are no new developments in the plans for our 50th reunion in 1954, but we are going to remind you at frequent intervals that at our age time goes rapidly and the date is really just around the corner, so make plans now to attend.

The Springfield *Republican* of February 8 has a two-column feature article on our classmate Charlie Egerton, XIII, who has completed a treatise on the history of the steam locomotive illustrated by original drawings. The title of the book is *Stephenson Started It*, and the volume is dedicated to the memory of George Stephenson, father of the steam locomotive.

The following announcement referring to our classmate Ed White, V, appeared in the February 8 issue of the Lowell, Mass., Sun. "Appointment of Edward W. White, for many years associated with the leather industry, as visiting lecturer in the leather engineering department at Lowell Textile Institute has been announced by Dr. Albert E. Chouinard, head of the department. Mr. White gave the first of his bi-weekly lectures Thursday. Mr. White's appointment was recom-

mended by the advisory committee headed by Kenneth E. Bell..."

In the January issue of The Review there was mention of the pleasant luncheon the Haywards had with Grace and Bill Anthony. On March 13 the Haywards made a sad trip to New Bedford to attend Bill's funeral. He had been required for several years to take things easy because of his heart, but the sudden fatal attack while attending a lodge meeting was wholly unexpected. Bill was of an old New Bedford family and was highly regarded in his home town. In spite of a heavy rain his services were well attended. Flowers were sent in the name of the Class. Bill and Grace were looking forward to attending our 50th reunion and had volunteered to collect and arrange any pictures of '04 persons, families and operations which might be available. Perhaps we can persuade Grace to continue the project.

A letter from our class Secretary, Henry Stevens, contains several items of interest. He expresses pleasure at the choice of Oyster Harbors for our 50th reunion and recalls that the golf enthusiasts played the Oyster Harbors course at our 25th reunion and had tea at the club house. Steve is complaining of the series of bad week ends we have been having which has interfered with visits by Mrs. Stevens and various friends. Sorry, Steve, but we can't do anything about that although we have arranged with the manager at Oyster Harbors to provide plenty of sunshine for our reunion in 1954. On February 19 Gus Munster and Ed Parker took Steve for lunch at The Meadows in Framingham. He reports letters from Dwight Fellows, Cap Curtis and Tammy Rockwood. Fellows wrote from Bonita Springs, Fla., and reported having a good time but was burned more than browned. Tammy had planned to go to Florida but gave it up, and in view of the mild winter here, is glad he did. Steve had heard of "Marc" Anthony's death and stated, "It shocked and saddened me. He was a valuable member of the old guard and we shall miss him." Steve had a picture of himself and Mrs. Stevens taken last October 12 which he had planned to send to the Anthonys for reunion purposes and adds, "Do you think Mrs. Anthony will carry on the project?" It was nice to get this newsy letter from Steve and we would appreciate it if others followed his excellent example.

Another letter from Steve reports as follows: "A distinguished service medal has been presented by Cecil H. Marble '25, Commander in Chief of the Massachusetts Consistory, to Dr. Howard Moore '32, of Newton, Surgeon General of the Massachusetts Consistory for his sacrifice of time in being on hand for all Consistory meetings and rehearsals." Congratulations, Howard! — *Acting Secretaries: EUGENE H. RUSSELL, JR., 82 Devonshire Street, Boston 9, Mass.; CARLE R. HAYWARD, Room 35-304, M.I.T. Cambridge 39, Mass.*

• 1905 •

There was sufficient encouragement, in fact demand, on the cards returned from our last questionnaire to warrant a reunion in June, 1953. Only one suggested any other point than Cape Cod, so that by the time you read these notes, the place and

time will probably have been decided. Three attractive hostleries in or near Osterville are already seeking our patronage. Another questionnaire, mailed to all who previously expressed slight interest, will be used to determine these points. Two or three fellows suggested a 48th reunion as a "warm up," where we could formulate plans, not only to assist the chairman of the 50-Year Gift Committee, but also the Secretary in planning physical details of the big event two years hence.

Lack of time and space prevented more than a mere listing of the deaths, which had occurred or been reported since the writing of the March items. It is doubtful whether any secretary of our Class had as much sad news to report in any one issue. They will be reported in the order the news reached us. William F. (Bill) Becker, VI, died at his home in Oak Park, Ill., on May 30, 1949. His daughter wrote that this was just one week after a long awaited return to Boston. This was his first return to Boston since graduation, his first trip by air, his first attendance at a National Convention of the Boy Scouts of America, in which he had long been a loyal and active worker. A few of us lunched with him and enjoyed the brief story of his life and his Boy Scout leadership. Two days after his return to Chicago, he left for the Boy Scout Camp at Delavan, Wis., helping prepare for camp opening. Two days later, still working, he dropped dead of a heart attack. Becker's entire business life was spent in Chicago as partner in the firm of Becker Brothers, electrical engineers.

Through his son we learn that John Charles Eadie, VI, passed away at his home, 61 Learmouth Court, Edinburgh, Scotland, on August 9, 1952, age 74. He prepared for M.I.T. at Glasgow Technical College. I quote from the letter "In World War I he held a temporary commission as an engineer lieutenant in the Royal Navy and was in the Reserve of Officers for several years afterwards. He returned to the English Electric Companys Ltd., and retired in 1932 having been in the London, Birmingham, and Sheffield offices. He went to live in the Isle of Man, where he had been educated at King Williams College. He lived there from 1933 to 1937 when he came to Edinburgh and remained here ever since. During World War II he took a war job with Bruce Peebles Engineering Company of Edinburgh."

James M. DeMallie, VI, died in Ridgefield, Conn., on December 4, 1952. Jim got his Ph. B. at the University of Rochester, New York, in 1901, his B.S. with us in 1905.

While the details are lacking we learn that David W. Bridges, VI, and wife of Baltimore were both instantly killed in a head-on collision on their return trip from a visit to a daughter in Buffalo, N.Y., on December 31, 1952. To date details are lacking, but Clarke Warren later notified us that two daughters survive. Dave was a tennis enthusiast and was actively at it at last reports, three years ago.

Alberto W. Small, V, died at his home at Yarmouth, Mass., on January 19, 1953. I have been unable to find any records, nor anyone who can remember him, but his son wrote that "he had taken one or

several courses at M.I.T. and that he was officially received into the Class of 1905. He was Bates 1894, and 85 years old at the time of his death." His obituary in Cape Cod papers indicate he was an educator superintendent of schools in several places, a 32d degree mason in New Hampshire.

Another accident has taken the life of a very popular classmate, Albert Champion Gilbert, V, who was killed when the car he was driving crashed into a bridge abutment at Gonzales, Texas, on February 12, 1953, resulting in his instant death, and also death a few days later to a business partner. Al was president of the Long Hill Orchards of West Newbury, Mass., and with his partner was on his way to California. He was buried in his boyhood town of Gilead, Conn. He had been interested in orcharding since 1918, making many trips from his home in Long Island. He leaves one daughter, Mrs. George F. Holman of Jamaica, N.Y.

While it is difficult to look at it in that sense, Henry Azor Wentworth, VIII, was released from his long and difficult incapacitation, succumbing at his home in Auburndale, Mass., on February 21, 1953. He and Mrs. Wentworth had taken their customary trip to Florida, but Harry's condition became worse and they were obliged to make a quick return. It is difficult to write a brief outline of Harry's life. I first met him on the train while commuting daily to M.I.T. from his home in Lynn, also at the Exeter Street Gym where we were on the basketball team together. No eulogy is necessary; he was always sterling, kind, helpful, everything. His first commercial venture was with the Huff Electrostatic Separator Company, then the Mount Champion Mining Company; then for several years he was consulting engineer in mining and metallurgy, railroads, and so on. On his return to Boston he was manager of several estates, vice-president of the Newton National Bank, a former president and director of the Farrington Manufacturing Company, of Jamaica Plain; a former vice-president and director of the A. S. Campbell Company, Inc., of East Boston; a former president and director of the Auburndale Cooperative Bank, a former director of Warren Bros., Cambridge. Active in civic affairs, he was a former trustee of the Newton-Wellesley Hospital. He was also a past president of the New England Golf Association. He leaves his wife, three sons, Nathan H., of Riverside, Conn., Vincent E., and Gordon K. Wentworth of Wellesley; and a brother, Wallace Wentworth of Washington, D.C.

Also, we have a notice that Roland Bendann of Hotel Belvedere, Baltimore, Md., died some time ago, date not given. Outside of the fact that he was with us in Course V for a while, we have no information whatsoever. With all of the above, perhaps a summary of vital statistics is in order. On our "active" list, including graduates, those who pay dues and those who show enough interest in class affairs to write letters, are 186. On the inactive list, mostly non-graduates, 107. Deceased 263.

Arthur J. Manson, VI, who retired from active business a few years ago writes from his address 539 West 34th St.,

Houston, Texas, as follows: "You are always interested in hearing from your classmates. Well, I am well, eating three good meals a day and keeping busy. In addition to my outdoor work on the lawn (my lot 130' x 180'), trying to grow roses, and so on, (my experience very limited), I spend time at my hobby. When I retired from Westinghouse Electric at Pittsburgh, Pa., and moved to Texas in October '48 I decided a hobby was necessary to keep my brain active. I had no hobby prior to that time. I chose photography, purchased a Medalist II camera, built my darkroom and was ready to go in the fall of 1949. I haven't spent much time with snapshots, and no color slides. I have spent my time trying to make pictures not prints. It is interesting how my own point of view has changed since I have taken up this hobby. I am now not satisfied with any picture size less than 1" x 14" and mounted. Haven't tried any solons to date." — FRED W. GOLDFTHWAIT, *Secretary*, 274 Franklin Street, Boston, Mass.

• 1906 •

The Youngstown, Ohio, *Vindicator* of January 23, included an article under the heading "Wick Heads Falcon Bronze Co. Board." The Wick referred to is none other than our classmate, James L. Wick, who has been president and treasurer of the Falcon Bronze Company at Youngstown since 1929. Following are some extracts from the article: "Wick said he will retain an active part in the company management but will have more time to devote to his hobbies and civic work here, including his interests in Mill Creek Park, Youngstown College and other organizations. 'Life is very full and interesting,' he said. Wick has been active in Youngstown industrial life for 46 years, and for many years was a close associate of James A. Campbell, former president of Youngstown Sheet and Tube Company.

"Wick was graduated from the Massachusetts Institute of Technology in 1906, then joined Youngstown Sheet and Tube Company. He left to go to General Fireproofing Company, but rejoined Sheet and Tube Company, then was named general manager of the Crystal Ice and Storage Company of which Campbell was president.

"During this period, the company cut ice in Mill Creek Park. One year the local crop failed and the company imported ice from Michigan. City Council threatened to send Wick to jail under a technicality in a law when he announced an increase in the price of ice. Ignoring the threat, Wick the next day raised the price of ice \$1.00 a ton. Gus A. Doeright, then president of Falcon Bronze and a member of city council, praised Wick for his courage and told him: 'We need a man like you at Falcon.' He offered him a good job, but Wick declined, returning to work for Sheet and Tube. Doeright repeatedly offered him a job, and after a year — on May 1, 1919 — Wick took the post as secretary. He was named president in January, 1929, a few months after Doeright's death."

The San Antonio Express of Sunday, February 22, devoted a lengthy article to our classmate, Terrell Bartlett, who was honored as Dean of Texas Engineers by

the Bexar Chapter of the Texas Society of Professional Engineers at a banquet to be held the following day. Classmates will be interested in extracts from the history of his career, some of which are as follows; "Son of the late General George T. Bartlett, who died at 93, Bartlett was born in his grandparents' home in San Antonio. . . . He set up his office here in the fall of 1908. In the years of his practice he has completed so many projects he cannot recall all of them. He does remember having worked in 90 different counties in Texas, New Mexico and Louisiana, the area to which his work has been confined. He built the first concrete bridge in Bexar County. He said it took a team a half hour to ford the river and climb the opposite bank before the bridge was built. Figuring a team and driver at \$3.00 a day, Bartlett said the span saved thousands of dollars by cutting time and hauling costs. From 1911 to 1913 he was engaged as an assistant to the chief engineers on the Medina project of dams and canals, brainchild of the late Alexander Y. Walton. Bartlett was one of the five who promoted the project. In 16 months of 1914 and 1915 Bartlett designed and built 40 concrete bridges in Bexar County with 'Good Roads' bond issues. He had full charge of bridge construction and was consultant on road work. He also put in 10 low-water bridges in the northern end of the county. For 15 years, 1915 to 1930 Bartlett was engineer for Landa Industries, building a number of flour, feed and cotton-seed mills. He also carried on municipal projects for a number of cities in that area. One of the projects in which he had a hand in his busy career was the Longhorn Portland Cement Mill and another, the Galveston Causeway.

"He has acted as consultant for the Texas Highway Department and the Texas State Planning Board and during the existence of the latter was its representative from the National Resources Board. In 1945 he completed an extensive survey and report on San Antonio sewers and flood protection work. However, this project has yet to be financed by bond issues. Although the veteran engineer did not specify which of his many undertakings he considered most notable, it was with a note of pride that he mentioned Hondo Air Force Base. On that project — for which he was chief engineer, designer and layout man — Bartlett with his associates effected a considerable saving to the taxpayers. The government had estimated Hondo would cost \$10,500,000. It was pushed to completion for only \$6,500,000. Bartlett is a past president and vice-president of Texas Section of American Society of Civil Engineers which he helped found in 1913."

To inject a personal note which may interest classmates, the Secretary would add that, after the death of Mrs. Benham, Bartlett who was a Course I man, extended an invitation to Frank to visit him in San Antonio. Frank responded to the invitation and thought he would like to go by auto but did not care to drive alone and therefore suggested that the Secretary accompany him. At this writing, that is, March 19, we are planning to leave Boston about April 6 and make the trip to San Antonio, to be gone perhaps as long as

three weeks. Needless to say, we are looking forward to seeing Terrell and much of the country which is entirely new to us. Your Secretary hopes to have a report of the trip in a subsequent edition of the class notes.

The Secretary regrets to report the death of Everett F. Tomlinson on March 14. Following is a brief history of Tomlinson's professional career as kindly submitted by M. S. Richmond, Assistant Secretary of the Class of '99. "Everett F. Tomlinson, M.I.T., Course XIII, President of E. F. Tomlinson Company, residing at 145 Pinckney Street, Boston, an unusually capable naval architect and construction engineer of wide experience, died on March 14 after an illness of several months. A native of Nova Scotia, he had lived for many years in Braintree, Mass. After teaching at M.I.T. for one year he entered the construction field, designing and building the larger types of commercial buildings. This was followed by a partnership in a boat yard where he built many ships of his own design. During World War I, while a member of the U.S. Shipping Board, he became interested in the Hickman Sea Sled and later became a vice-president of the Incorporated Company. In 1914 he designed the main steel frame of the 40-foot Sea Sled, the first high-speed motor torpedo boat ever built in any country which, with an 18-inch torpedo forward, could be driven at 40 m.p.h. in heavy weather without showing structural weakness. Again in World War I he designed the main steel frame of a similar 54-foot boat that could carry a 21-inch torpedo and travel at 33½ knots in rough water. This was followed by the Navy 55-foot high-speed plane carrier traveling at a speed of 55 m.p.h. Recently he has been in charge of all detail designs of Military Sea Sled boats including a 78-footer and a high-speed rescue boat. He was a man with the ability to meet complicated structural requirements and a fine sense of line and proportion. He was a Mason and formerly a member of the University, Hingham Yacht, and South Shore Country Clubs."

Our classmate, Charles Kasson, was closely associated with Tomlinson during undergraduate days. Although spending practically all his professional career in Boston, he did not seem to be interested in affairs of the Class or the Institute. — JAMES W. KIDDER, *Secretary*, 215 Crosby St., Arlington 74, Mass. EDWARD B. ROWE, *Assistant Secretary*, 11 Cushing Road, Wellesley Hills 82, Mass.

• 1907 •

A clipping from the Cincinnati, Ohio, *Enquirer* of January 3, 1953, states that on January 2 Fred Morrill of our Class was elected to the Board of Directors of the Ferro Concrete Construction Company. This announcement was made by Henry Loring, president of the company, who as you know, is also a member of our Class. Fred joined the Ferro Company in 1915 and has been project engineer on many construction jobs in the Cincinnati area. Before going to Cincinnati, he spent three years in China as a professor of Civil Engineering at Pei Yong University.

Henry J. Kent, who was associated with our Class during our freshman year in the

course in electrical engineering, died on January 15, 1953. I do not remember this man at all, but possibly some of you who took Course VI may recall him. I know nothing of his doings since 1907. His address at the time of his death was 3901 Connecticut Avenue, N.W., Washington, D.C.

Under date of February 15 I received a brief letter from Max A. Greenburg, who is manager of the British Thomson-Houston Company in Tel Aviv, Israel, and whose home address is 23 Chen Boulevard in the same city. This note from our classmate referred especially to his inability to contribute to the M.I.T. Alumni Fund on account of the very serious economic situation which exists in Israel. The letter states that "the Israel Government is not in a position to provide 'dollar' currency except for the country's most vital requirements, and even allocations for payment of insurance premiums are not available." I have written to our classmate requesting him to write me telling something of his business activities, his family, and the general condition of affairs in Israel, and I shall hope that I may have from him a letter which I may quote to use in some future issue of The Review.

I have changes of address for two of our classmates as follows: Laurence R. Davis is now at 1209 August Way, Antioch, Calif. Byron P. Luce may be reached in care of Ralph E. Mott, 370 Chicago Way, San Francisco, Calif. I have written to these two men also and shall hope to have further word with reference to them to record at a later date. — BRYANT NICHOLS, Secretary, 23 Leland Road, Whitinsville, Mass. PHILIP B. WALKER, Assistant Secretary, 18 Summit Street, Whitinsville, Mass.

• 1908 •

Have you signed up for our 45th Reunion? Your early reservations will help the Committee in making plans. Our reunion is being held at Snow Inn, Harwich Port, Mass., on Cape Cod, on June 12 to 14 with Alumni Day at Technology on June 15. The third dinner meeting of the 1952-1953 season was held on Thursday evening at the Faculty Club, 50 Memorial Drive, Cambridge, Mass., with the following present: Monroe Ames, Bill Booth, Nick Carter, Myron Davis, George Freethy, Sam Hatch, Winch Heath, Steve Lyon, Linc Mayo, Mat Porosky, Henry Sewell and Joe Wattles. It was nice to see Bunny Ames, as it has been many moons since he has been with us, and also Mat Porosky whose monthly visits to Boston seldom hit one of our meetings. We had planned no showing of pictures, so time after dinner was taken up by a general discussion of our 45th Reunion in June, also news about absent classmates.

Linc Mayo reported that the class treasury is showing signs of improvement due to checks for class dues which have been received. If you have not as yet sent your check for class dues, please do so to speed the recovery of our class treasury, which should be "alive and kicking" at our 45th. We have just learned that Harry Rapelye, President of Canadian Continental Can Company, Ltd., retired last fall and now lives in Hartford, Conn.

We are sorry to report the deaths of

Ernest Kilburn at Wilmington, N.C., on March 6, 1953, and Arthur Skillings at Allston, Mass., on March 18, 1952.

The fourth and last dinner meeting of the 1952-1953 season will be held at the Faculty Club, 50 Memorial Drive, Cambridge, Mass., on Thursday evening, May 14, 1953. Usual notices will be mailed, but plan now to come. Don't forget our 45th Reunion at Snow Inn, Harwich Port, Mass., on June 12-14. Come and see your old friends. — H. LESTON CARTER, Secretary, 14 Roslyn Road, Waban 68, Mass.

• 1909 •

In the April number of The Review we told of the passing of Laurence Winchester, VI. Since that time, thanks to Mrs. Winchester, we are able to tell more of Laurence and his career. He and she (then Alice E. Hunt) were in the same class throughout their school years in Reading, and while he was at the Institute she was a student at the Massachusetts School of Art, then around the corner on Exeter Street. They were married in June, 1917, while Laurence was Transportation Engineer for the Boston Edison Company, which position he held for eight years. He then spent four years with Arthur Perry and Company, public utility bonds, with whom Ken May was also associated. He was next employed as an assistant to Mr. Frederick A. Waldron, a New York consulting engineer in his extensive study of the trend of the future growth of the Boston Edison Company. Laurence on his own then made a similar survey of the Charlestown (Mass.) Gas and Electric Company. He extended this work, which finally developed into statistical engineering, as well as economic research, to a number of other utilities including Duquesne Light Company of Pittsburgh, Pa.

After several years in Pittsburgh he returned east as statistician with the Atlantic Public Utilities of Boston and New York. His last work was with Stone and Webster at the atomic energy plant at Oak Ridge, Tenn. Mrs. Winchester states: "It proved to be a difficult assignment in many ways and he came home exhausted in June, 1948, after a period of three and a half years there. . . . He was outstandingly fine in every way." We who knew him can pay him the same tribute. Besides Mrs. Winchester, he is survived by one son, Dean S. Winchester, a graduate of the Engineering School of the University of Virginia who is now with the General Electric Company at Electronic Park, Liverpool, N.Y. There are three young grandsons. The Class extends its deepest sympathy to Mrs. Winchester and the family.

We have learned of the death of Joseph Matte, I, which occurred on September 5 at Detroit. Our records show that after short periods in Hartford, Conn., and Chicago, he lived in Michigan, mostly in Detroit. He was a brother of Al Matte, VI, who retired recently from the Bell Telephone Laboratories. Jack Moses, VI, who is in Detroit, knew Joe and on several occasions had lunch with him. He states that Joe's wife died several years ago and he then led a rather lonely life. He did not care to discuss his personal news, his schedule being work, going home and reading, and sleeping. He had two daugh-

ters, both of whom are probably married. During the past few years he had several operations and had not been too well.

We were more than pleased to hear from Jack. His stationery has the letter-head "A. L. Moses Company," 186 Pierce Street, Birmingham, Mich., and he writes: "The two boys are in business with me and the third will join us this summer when he completes his two years in Korea in July. Then our set-up will be complete. We are still manufacturers' representatives and cover the state for 10 companies. We are also interested in farming or raising meat (no milk). Have about 250 Herefords and about 600 acres of good Michigan soil and those, together with my little hot house, give me plenty of diversion and I don't even have to go to Florida to get the sunshine."

Our President, Jim Crittett, XIV, has appointed Jack as an Assistant Secretary to represent the Class in the Detroit area. This makes three of our undergraduate presidents holding class positions, Jim, Molly, XI, and Jack. Incidentally, Molly has consented to the nomination as Vice-president.

Jack speaks of not needing to go to Florida, but several of the Class seem to find such a visit a necessity.

George, VI, and Mrs. Witmer spend their winters at Ormond Beach, Fla., and have another residence at Warrenton, Va. George has had some trouble with his eyes and teeth. However, he treats the entire matter with a characteristic sense of humor, saying: "I am a mess, and yet I am very well. I should be in a wheel chair and yet I am fairly active. . . . All told I could not sleep, speak, eat, walk, or see but instead of biting everybody I met, people remarked that I should be worked over frequently by the doctors since it made me less obnoxious than usual. Both Florida and California are overrated. If you come down next winter, please let us know and we shall be glad to see you." George states that the doctor says that he will eventually have a 20-20 vision and we all hope that it will develop soon. He and Mrs. Witmer have established a trust fund at the Institute which at present has a book value of nearly \$90,000.00 and a market value of approximately \$115,000.00. We asked George if he would be willing that credit go to the Class for the amount of the fund and he graciously replied: "I can see no reason why the Class should not claim credit for this if they so desire." Both the Class and the Institute are most appreciative of the generosity of George and Mrs. Witmer.

Another classmate, George Emerson, XI, makes Boca Raton his headquarters. He writes: "Dear Chet: Your guess was correct. My active work with the Travelers ceased on May 31, 1952, and I am now on their retired list. Until my retirement I was Superintendent of the Improved Risk Department of the Travelers Fire Insurance Company. I have two daughters. The older one, Norma, graduated from Pembroke College of Brown University last June and is now a Reservation Agent with the American Airlines at LaGuardia Field in New York. My younger daughter is a freshman at Rollins College in Winter Park. My wife and I

have visited southeastern Florida many times during the last 15 years and we both made up our minds that we would sometime make it our permanent home. We drove down twice last spring and finally decided to buy the house which we now occupy. The Intra-Coastal Canal and Boca Raton Lake are across the street from us and the ocean is a quarter of a mile to the east. The well-known Boca Raton Hotel is within our view across the lake. The latch string is always out at the corner of Spanish Trail and Fern Drive, Boca Raton, and it is hardly necessary to remind all my friends that I shall be glad to see them if they are down this way. A few days spent in Boca Raton will make them permanent residents. I was glad to hear from you, Chet, and trust that you are still going strong."

We also receive notices that Lewis Nisbet, I, commutes semi-annually between Yarmouth, Maine, and St. Petersburg, Fla., and Tom Spooner, VI, does likewise between Ohio and Fort Lauderdale. There may be others that we have overlooked. We could almost hold a class meeting down there.—CHESTER L. DAWES, *Secretary*, Pierce Hall, Harvard University, Cambridge 38, Mass. *Assistant Secretaries*: A. L. MOSES, 186 Pierce Street, Birmingham, Mich.; MAURICE R. SCHARFF, 366 Madison Avenue, New York, N.Y.; GEORGE E. WALLIS, Wenham, Mass.

• 1911 •

At this mid-March writing the name of our General George C. Kenney, I, is in the news again—this time for his forthright statement in a Denver, Colo., speech that since war with Russia certainly seems inevitable, the time is now here when the United States should refuse to continue taking rebuffs and insults from behind the Iron Curtain. According to George, the time is now here when we should start something positive.

On March 1 Philip S. Morse, 94, and a graduate of M.I.T. in the Class of 1884, died at his home in Brookline. He was the father of Bob Morse, VI, and one of the oldest members of the American Institute of Mining Engineers. He is survived by two sons, a sister, seven grandchildren and 12 great-grandchildren.

When Mark Kinney, IV, and his wife go on a winter vacation, as has become their custom, they like to go somewhere that will give Mrs. Kinney a chance to practice her hobby of painting. According to *The Royal Gazette*, as expressed in a headline on February 9, "Art Brought Them To Bermuda for a Holiday." The story continued: "In answer to an inquiry, Mrs. Christine Diel, president of the Bermuda Art Association, replied, saying that Mr. Herbert Holt, an English portrait painter and art teacher, had been loaned to the association's art school for a year—so Mr. and Mrs. Kinney decided to come to Bermuda.

"They arrived by Pan American Airways three weeks ago and are staying at Waterloo House until the *Queen* sails for New York via Nassau on March 2. While Mrs. Kinney is here she is developing a new technique under Mr. Holt's guidance. Mr. Kinney is president of J. S. Ringwalt and Company, an 84-year-old dry goods firm, a member of the Society of

Mayflower Descendants and a Son of the American Revolution."

Well, sir, I finally got a reply from Sid Marston, VI, to whom I wrote after learning from Cal Eldred, VI, that he was now at 168 Lewis Avenue, Westbury, Long Island, N.Y. Sid wrote: "It has indeed been a long time since I 'Wrote To Dennis'—but it is not your fault. Probably my best excuse is that I never seemed to have news that I felt particularly interesting. Now I will say that I ceased teaching back in 1920 to take a fling at the automobile business; remained therein—in various positions—until 1950, when I moved here to take over the accounting duties in a concern started by my son and a partner (Teletronics Laboratory, Inc.). I have four grandchildren—so far. Regards to all."

It took a clipping from the Meriden, Conn., *Journal* to see how another Course VI course mate, Davis H. Tuck, now looks and what he's been doing. According to the *Journal*: "Davis H. Tuck, consulting engineer from Redding Ridge, Conn., will be the speaker at the monthly meeting of the Connecticut Section of the Illuminating Engineering Society, his subject to be: 'Lighting Calculations and Lighting Distribution Curves.'

"Mr. Tuck is a graduate of M.I.T. and has been associated with McGraw-Hill Publishing Company as news editor; with the United States Bureau of Standards and United States Public Health Service; and as chief engineer of the Holophane Company, New York City, he has been on several national technical committees of the Illuminating Engineering Society, and is a fellow and member emeritus of the society."

Had a nice note from Obie Clark, II, saying that he was sorry he had to miss the mid-winter dinner but that he and Alma planned to be at Snow Inn, Harwich Port, for our informal get-together on June 19-20-21. He wrote: "We have sold the cottage at Harwich Port that Alma's people have owned for more than 50 years. As I still have to work (there is no one to pay me a pension), we do not have much chance to use the cottage. However, business prospects for my little company—Nelson Cement Stone Company, Braintree,—look good this year. We will make a net profit in the first quarter, which is unusual in our line, and have more work on order than ever before."

Charlie McManus, I, writes that he and Elinor plan to be with us on Cape Cod in June, adding that "it was very nice to hear our General George Kenney on 'Truth or Consequences' on the radio last evening (February 26). He sounded very natural."

At the 41st annual meeting of Riley Stoker Corporation in Worcester in late February, Fred Daniels, VI, was re-elected chairman of the board and vice-president. In his report Fred stated that "new business closed during 1952 substantially exceeded the volume of any previous year in the company's history, so the year's operations were profitable and unfilled orders on company books are at an all-time high figure." Early this month, listening to radio station WTAG (Worcester) Sara and I "caught" a Red Cross spot announcement by Fred—well done.

Carl Richmond, I, also wrote of his disappointment at having had to miss the

Mid-winter Meeting. He enclosed two clippings from a recent Cambridge Chamber of Commerce monthly magazine each including a "shot" of Albert Wilson, I, who recently retired after one year as Chamber president. Al, of course, still is president of A. O. Wilson Structural Company in Cambridge. Carl said he had also had a letter recently from Julius Waldstein, I, who is now known as Joseph Webb and is at 1842 Summer Street, Charleston, W. Va.

When these notes reach your reading eyes, there will still be a month left in which to make plans to attend 1911's informal get-together week end, June 19-21, at Snow Inn, Harwich Port. As instructed, make your reservations directly with Frank Thompson, Manager, Snow Inn, Harwich Port, Mass.,—our special rate being \$13.00 per day per person, American plan, plus tax and tips as desired.

Hello—here's an airmail letter at hand from Honolulu. Oh, yes, Walter Welch, VI, told me in New York in January he was facing an operation and then hoped to hop to Hawaii to recuperate at the Honolulu home of his son, R. C. Welch, District Manager, Philippine Air Lines. Let Walter tell the rest: "Upon leaving the 1911 luncheon on January 13 I went to the Polyclinic Hospital for a checkup, with the end result that I am recovering here with only one kidney. Am doing fine and expect to be back in New York City the end of March. Now I know that one can live with only one kidney and a lung removed about eight years ago.

"Of course I am looking forward to the class get-together at Snow Inn the third week end in June and I'll be there, if nothing happens to prevent."

It's been fun lining up a class roster to send out to all active members of the Class in connection with a general letter suggesting attendance at our informal get-together at Snow Inn, June 19-20-21. We now have 249 graduate and associate members of the Class and 85 former students who have never paid either class or alumni dues, nor have they subscribed to any of the alumni funds and so they are classified as non-associates. In this category we still have addresses for 18 in Metropolitan Boston, 13 in the balance of Massachusetts, eight in the other five New England States, seven in metropolitan New York, four in the rest of New York State, eight in other Atlantic States, three in the middle west, 14 in the southwest and west and 10 in Territories and foreign countries.

And so to bed, with three address changes: Lester D. Cushman, IV, Box 178, North Woodbury, Conn.; Stafford A. Francis, IV, 10004 Arden Avenue, Rosedale Gardens, Livonia, Mich.; and John B. Romer, 4554 Lahm Drive, Akron 19, Ohio. See you all in June, I hope! — ORVILLE B. DENISON, *Secretary*, Chamber of Commerce, Gardner, Mass. JOHN A. HERLIHY, *Assistant Secretary*, 588 Riverside Avenue, Medford 55, Mass.

• 1912 •

Your Secretary enjoyed a telephone conversation with J. H. Pratt when in Chicago last week and learned that Priscilla and Jay had just returned from a

month's trip to Mexico. After spending two weeks at Acapulco, they visited the sights of ancient civilization. Jay is special assistant to the Chicago District Chief of Ordnance, working on production problems of the sub-contractors.

Frederick Busby, who lives in Watertown, Mass., is now in the Accounting Division of the M.I.T. Division of Industrial Co-operation. After several years of engineering, Fred taught accounting at the Bentley School in Boston for 16 years, put in five years with the Navy as a special cost accountant and then six years with Burdett College teaching accounting. Fred's three children have presented him with 13 grandchildren which he says keep him busy.

Wallace J. Murray, Sr., chemist with Arthur D. Little of Boston, is enjoying a Caribbean cruise with his wife.

C. K. Reiman reports that he is still commuting to Chicago and other mid-west cities as a Consulting Chemical Engineer under his own name. His youngest son will graduate from Yale this year in Chemical Engineering and will probably join his father. C. K. boasts three grandchildren at the present time. As grandchildren seem to be the center of interest to most of us, your Secretary would be more than pleased to hear how the rest of the Class are faring in this respect. — FREDERICK J. SHEPARD, JR., *Secretary*, 31 Chestnut Street, Boston 8, Mass. Assistant Secretaries: LESTER M. WHITE, 4520 Lewiston Road, Niagara Falls, N.Y.; RAYMOND E. WILSON, 8 Ogden Avenue, Swarthmore, Pa.

• 1913 •

June is just around the corner, and Bill Mattson, with plenty of help from his eager reunion committee, has left no stone unturned to lure you to come to the party at Oyster Harbors Club. I hope that you will join the 90 others who plan to attend. News from classmates is meager, but of good quality.

Fred Rich, X: "I've been holding the letter of Bill Ready, the memo of Larry Hart, and somewhere a letter from Fred Murdock, with the idea of getting 'round to write somebody about something, somewhere. And somehow writing letters, except strictly business, are just about the last thing I seem to want to do any more. Well, anyway, I want to do my part to help the June shindig for Class '13, and so here is my fiver to bear a part of the expenses, in the hope that as many as possible may get the news and enlightenment, and consequently be given additional incentive to pull up their sox and get to the Oyster Harbors Club June 12-14. For myself, I've been gazing at the calendar and trying to foresee how I can plan a schedule to keep my things going, and get away for a while too. One thing I want to do is to give you a correction of my address, which now stands on page 12 of the Class Roster list, and after due time turns up to be some 1,700 miles away, which is, of course, my own fault. So here I want to give my present one to you: Frederick D. Rich, 2153 S.W. 10th Street, Miami 35, Fla. The reason for my being here in Florida rather than in far-off St. Albans, Vt., is that four years ago the hotel in which I was, burned to the ground at 30 degrees

below zero. After five months of hospitalization and recuperation after that the doctor advised me to get to a milder climate. So here I am and have been for three winters. Fortunately I have been able to take up my work again, and with the aid of air mail, special delivery services, I can carry on my work as Managing Editor of the *Glass Digest*, merchandising magazine of the Flat Glass and Allied Industries, about as easily as I could in New York. . . . I've been doing this magazine for almost ten years. At one time was handling three at one time; but the pace was a bit too fast to keep up at these mature years. So there's a résumé for the news record; and the fiver for the expense record. And now I'm looking forward to seeing grand old stalwarts of 1913 in '53."

Phil Burt, VI: ". . . Practically my entire life, since leaving the Institute, has been in the business end of education, first with the Babson Institute and for the past eight years as Purchasing Agent at Wellesley College. While college work is not the most remunerative field in the world, it does have its compensations, and I have been very happy in my work. The plans for our 40th reunion at Oyster Harbors sound interesting and I hope that I shall be able to go. I cannot be sure at this time as the date conflicts with our Wellesley Commencement. It would be nice to see the boys again and I am going to bend every effort to get down to the Cape in June."

Al Brewer, III: "This is in reply to Bill Ready's letter of December 10. I have sent my check for \$5.00 as he requested to Joe MacKinnon. Now 'wotinell' can I tell you as to news of the Brewer clan? Not much is new down in this clam digging neighborhood except that we seem to be exempt from ice storms, snow and your old-fashioned winters. That compensates to some extent for the commuting ordeal which I have to undergo daily. I did have a reprieve from it last December as I went down to 'deep in the heart of' Texas after the annual meetings of the Mechanical and Refrigerating Engineering Societies. (Got to get in a plug for Texas, otherwise my wife may not let me come to the reunion.) Seems every time I tell someone in an engineering society that I'll do a 'spot' of work, they put me on a darned committee. The last Refrigeration Society annual meeting was fun, however, as I was chairman of the entertainment committee and had to preview some acts. Some of my committeemen wanted to consider the 'Minsky' type, but I convinced them to 'be their ages.' We drove down to Texas on our vacation and learned the good way to travel by consulting truck drivers instead of following A.A.A. and Texaco road maps. . . . While in Fort Worth I made a short business trip to Houston and inspected a number of the latest oil field drilling rigs. . . . No other news except to say I became a granddaddy for the fourth and fifth times last fall. Both Gordon and John had youngsters in their families — one boy and one girl. So far the entire crew are doing fine, so we feel we have lived right in being blessed with such a good bunch of boys and grandchildren. Be seeing you at the reunion, if I don't get to Boston sooner. Though by the way, I will be there in

April as I will be up for the annual meeting of the American Society of Lubricating Engineers. Incidentally, I'm trying to fix up a textile session for the meeting, so maybe you'll be interested. Will send you details later."

Al Conant, II: "You may recall that in 1948 while the Class was at the New Ocean House in Swampscott, I was in the hospital for surgery because of tuberculosis. The Class sent me some beautiful flowers. The operations did not do me any great amount of good. Was having another series of hemorrhages when your letter arrived. Now I am again on the mend. Amateur radio is my activity and it is a blessing for shut-ins. Have a small amount of equipment but enjoy it."

Larry Hart, XI: "I have just returned from a business trip of almost five weeks to our middle west and Pacific Coast plants and offices and I find your very welcome and interesting letter of January 6. My wife and I fully intend to attend our 40th Reunion at Oyster Harbors Club on June 12, 13, and 14, and as soon as details of the program and arrangements are received, I shall forward registration and reservation request. . . ."

Ad Cardinal's brother Paul, Class of '24, wrote: "In the Class of 1913 notes you might mention that my brother, Adolphe C. Cardinal, XI, known to most of his classmates as Ad or Frenchie, suffered a stroke last June 15 following which he was in the hospital for some 13 weeks. He has been coming along nicely of late and is able to get around a little. He won't be able to attend the reunion this year, and he can't indulge in appreciable correspondence, but news from any of his classmates will be greatly appreciated by him if addressed to his home: 102 Hawthorne Avenue, Nutley, N.J." We shall miss Ad's cheerful personality in June, and I have written him to that effect. I'm sure that Ad would appreciate letters, at least from those who knew him well.

A post card dated January 11, '53 brought sad news from Mrs. Arthur H. Clark, V: "I received the notice sent to my husband about the 1913 class reunion of M.I.T. I want to inform you that Arthur passed away on August 19, from an attack of coronary thrombosis. We were living in Childersburg, Ala., at the time, where he had been transferred to be personnel director of Beaunit Mills." Charles W. Brown, XIV, wrote on January 10, '53 of the death of Edward N. Taylor, XIV, in 1937 at St. Lukes Hospital, N.Y.C.

Address change: William Guild, XI, from West Newton, Mass., to The Science Club, Post Office Box 126, Station A, St. Petersburg, Fla. — FREDERICK D. MURDOCK, *Secretary*, Box 788, Pawtucket, R.I.

• 1914 •

Again it becomes necessary for your secretary to record the deaths of three of our classmates, one of which was by fire. Arthur R. Stubbs apparently fell asleep in a chair in his home while smoking. Late in the night his wife was awakened by heavy smoke, but the flames had spread so rapidly that she was unable to reach her husband. He had apparently already suffocated and thus was not awakened by the flames. The death occurred on March 9 at their apartment in Brookline, Mass.

Stubbs came to the Institute from Rockland, Maine, and studied Sanitary Engineering. He was a member of Phi Beta Epsilon, served on the Institute Committee, and won his numerals on the track team. During World War I, Stubbs was a lieutenant in the Air Service, qualifying as a free Balloon Pilot and Aerial Observer. He participated in the Meuse-Argonne offensive and was recommended for the Distinguished Service Cross. Those who have a copy of "Technology's War Record" will find an interesting account of Arthur's exploit on page 196. Stubbs was married on June 26, 1922, to Margery Scott, who, with a son Philip, survives him.

Lyle K. Webber of Toronto, Canada, died in that city on January 7. He came to the Institute from Hamilton, Ontario, graduated in Mechanical Engineering, and was a member of Theta Delta Chi. Although Webber had been engaged in other industrial enterprises during his lifetime, at the time of his death he was General Works Manager of Moffats' Ltd., of Weston, Ontario. He never married.

Albert R. Losh died at Albuquerque, N.M., on December 26, 1952. Losh, a civil engineer, took only a few special courses at the Institute. His lifework included service with the U. S. Bureau of Public Roads, City Manager of Oklahoma City, and, in more recent years, his own engineering business at Albuquerque. His family status is not recorded in the class files.

Thorn Dickinson, who as resident engineer for Stone and Webster has traveled far and wide, is no longer stationed in Turkey, but is part way back home again. He is with the Quebec North Shore and Labrador Railroad at Mont Joli, Province of Quebec, which is at the Gaspe Peninsula just about where the St. Lawrence River meets the Atlantic Ocean.

Art Peaslee managed to get his usual winter travel vacation in this year. He joined the considerable group of Technology gringos who journeyed to Mexico City to join with the Tech Club of that city in a special M.I.T. Fiesta. This is an annual event, and any Fourteen man desirous of joining this group should write your Secretary not later than early fall of any year.

Harold A. Mayer, who has been in Portland, Ore., writes that he has given up both the apartment building he was looking after and owned, and also his teaching. He has acquired instead a place out from the center of the city where traffic is not so heavy, the reason being a seven-year-old son who likes to play around in the country. Mayer says he is still interested in meeting up with any Fourteen men who happen to be out his way.

Remember that Alumni Day is Monday, June 15. Fourteen has its own private afternoon party also on that date. Plan to be with us then. — H. B. RICHMOND, *Secretary*, 275 Massachusetts Avenue, Cambridge 39, Mass. Ross H. DICKSON, *Assistant Secretary*, 126 Morristown Road, Elizabeth, N.J.

• 1916 •

Last year about this time, we gave a word of warning to the many sportsmen of our group to take it easy those first few trips around the golf course, or the first few sets on the tennis courts, or sailing, fishing, hiking, and so on. That applies

again this year as well. While many of us would like to believe that we are just as sharp as we were a few years back, it just "ain't" so.

At the top of the mail sack this month, we find this interesting letter from Dave Patten: "In the file of unfinished business is your 'round robin' letter of December 22, with its timely and heartwarming ending. I always find some excuse to get back to New England, although the post war period has found this more and more difficult. For this reason, as well as the fact that I maintain the Old Standish Homestead in Duxbury, from whence this is being concocted, the Cape is as attractive as any place that I can think of for future reunions in and out of 'quinary' season. Without loss of originality which rightly belongs to members of the distinguished Class of '16, or wishing to burden the hard-working class secretaries, what has been the experience of other classes as a question put to their secretaries might reveal? For personal items, as has been our good fortune for several years, since returning from the European Marshall Plan assignment in the spring of 1950, we have spent the better part of the winter season in Washington, thanks to the repeated offer of the home of our friends, General and Mrs. Spaatz. This will continue, I trust, but for the moment we are in residence in Duxbury, which conforms with my current efforts to meet the taxes on time and keep the larder filled, or is it the deep freeze? In closing, I'd like to comment on the serious matter of being over the 50-year mark, as most of us are. The first half of the century has been marked by wars and depressions such as our forebears never experienced, although these Pilgrim shores might deny that. The period has been exciting in any historical record, and now under the dynamic leadership of President Eisenhower and with the aid of the Metropolitan Life Insurance Company's good health broadcasts, to say nothing of isotopes and the atomic age, we should both be able to give from our unique span of living and reap in return, a final 50 years which will be the best of all. Such is my hope and wish, collectively and individually, until the centenary of 2016. Some of us are quite certain to be around that long and be holding the reunion on the moon, or Mars."

Our good friend, Cy Guething, seems to be enjoying himself as usual. We received a card from him recently from his "Shangri-La" in Nassau in the Bahamas. He wrote: "Saw on the Register that Steve Brophy was here last week. Am trying to locate Raef Alfaro-Moran and believe the class address is n.g., but will know for sure next week. Next to being in New England, this is good."

We had word too from Frank Chandler in Marblehead, "Thanks for your note regarding the sudden death of Edwin Ekdale. I called him up after your last letter informing me that he was convalescing at Newton and had a nice talk with him over the phone. He said he was feeling pretty good and would drop in to see me the next time he drove down towards Marblehead. I intended to drop in to see him if I ever got up his way. But like all my promises, I kept putting it off until it was too late; so many things I want to do, but

always something comes up before I get around to doing them. That is how you are getting this letter — the same day I received yours. You said 'scribble a few notes for the Review class notes,' so I decided to do it now. Then I decided to try to 'one finger' on the typewriter, because if I wrote longhand you would not be able to read it." He then notes that he has on hand a number of the 1916 paperweights which he had made up especially for distribution at the 35th reunion. It's an attractive molded stand, 4 inches high, antique red finish, in the shape of a shield bearing the college seal with a base carrying the legend "M.I.T. Class of 1916." Said he would be glad to send one to any member of the Class who didn't get one at the reunion. They're much worth while having — he says just write to him at 65 Pleasant Street, Marblehead, Mass., and he'll be glad to send one to you. He goes on to say: "My son, Frank, left these parts in April to make his fortune (?) North American Aviation Inc., Los Angeles, Calif. He is married and has set up a home there. I expect to take a trip out there in June, then stop at Denver, Colo., and pick up my daughter at the University of Colorado and bring her home for the summer. She wanted to go to Colorado to get out on her own; also, because her brother was in Los Angeles, she could take a plane down to see him if she got a chance. I'm still here in Marblehead, away from the 'hustle and bustle' of New York, and perfectly contented. After the kids get their fill of sightseeing, they will realize what a nice comfortable place we have here in Marblehead. If you get down around this neck-of-the-woods, drop in and see us. You will have no trouble finding us. Right next to the Post Office."

Your Assistant Secretary has been in contact with Eddie Ekdale's sister since his sudden passing from a heart attack in January, and one bit of information was of particular interest. Eddie had apparently long been doing research work on Biblical times, pre-Christian times, and he had made an intensive study of the old Hebrew characters. He was planning to write a book for reference which would be entirely different from anything now available. He thought there was a need for such a reference book to enable students to get a better and clearer understanding of these old times.

A short letter from Jimmie Evans indicates that things are moving along nicely for him. A note from Jack Burbank informed us that a little travel was in the offing for him: "I am taking off for a quick business trip which will take me into Nashville, Tenn., Jackson, Miss., New Orleans, Houston, Port Arthur, and Dallas." Jack still gets a great deal of pleasure from his golf game. Speaking of trips, your Secretary recently had to pass up a trip to the west coast where he was scheduled to present a paper to the Dimension Stone Committee of the American Institute of Mining and Metallurgical Engineers on the history of the granite industry in Massachusetts, its present activities and plans for its development in the future. The flu had laid your Secretary low for a short period and his son stepped into the gap and presented the paper. We are happy to say that your Secretary success-

fully kayoed the flu bug shortly thereafter and was able to enjoy a quick jaunt to Switzerland.

Joe Barker recently sent us a copy of the Annual Report for 1952 of Research Corporation. At the most recent reunion, Joe told us of some of the activities of his group, and it was very interesting to us. With the thought in mind that this too will be of interest to many of us, we quote below from the annual report the objectives of his organization: "Research Corporation is a nonprofit foundation which distributes its total net income as grants-in-aid of research to colleges, universities and scientific institutions. The foundation was established in 1912 by Frederick Gardner Cottrell with the gift of his patent rights in the field of electrical precipitation for the following purposes set forth in its charter: To receive and to acquire inventions and to render the same more available and effective in the useful arts. To provide means for the advancement of scientific investigation by contributing the net earnings of the corporation to scientific and educational institutions. To receive other moneys and property and to apply the same to the objects specified." Elsewhere in the report, we noted that "During the fiscal year ending October 31, 1952, Research Corporation made a total of 258 grants, amounting to \$797,689." Joe has been president of the Research Corporation since 1945, and has been doing a wonderful job in that capacity. In acknowledging receipt of the annual report, we called Joe's attention to Dave Patten's plans for 2016 and invited him to be present. Joe wrote back: "If space ships develop as per Buck Rogers, then Dave Patten should consider organizing the 1916 100th Reunion not on the moon — a dreary and dry place by all astronomical reports — but on a special reunion space ship equipped with a 'snake pit.' And speaking of snake pits, how are plans coming for Coonamessett in June of 1953? You ask for news but there ain't any — Joe and Mary Barker keep shop at the same old site, 45 Beechmont Drive, New Rochelle, having a marvelous time. We have been so busy we even have had no chance for a trip — long planned but as often deferred — to the Northwest Territory, Alaska and Hawaii. We will have to travel to Florida in late June for the American Society of Engineering Education convention at Gainesville, where I am scheduled to speak. Then to Los Angeles in July for the American Society of Mechanical Engineers' convention of which I am presently chairman of the Meetings Committee."

On the question of the reunion, Joe and other reunionites, we are definitely of a mind to have the reunion this June. The response from the Class would indicate that while we cannot expect the interest to be as great as it will be for the five-year reunions, we should have an annual reunion, and these annual reunions should run along more or less informal lines with no planned program but rather just a completely leisurely type of week end where conversation, good spirits and rest reign supreme, that these week ends should be held in June and on the Cape, and according to the wishes of many at Coonamessett Ranch Inn. By rights, the an-

nouncement of the reunion dates and the location and other particulars should appear in this column; but at the time that this is being written (March), we haven't been able to settle on the week end. On the Alumni Day week end, June 12-13-14, '03 and '33 from M.I.T. have Coonamessett all sewed up and have had it that way for quite some time. Still, in the past, most of the fellows who have been able to get to Coonamessett for our get-togethers have had to pass up the Alumni Day activities so that they could be on hand for business as usual on Monday morning, and we are, therefore, considering keeping it at Coonamessett and having our week end be that of June 5, 6, 7. We mention this so that you will have an idea of what we had to consider in selecting our location and dates for this year. Actually, you will have received all of the particulars on the reunion in a special mailing. (As this is being written in March, our plans call for mailing of this special notice in mid-April.) Whether or not we have interpreted your wishes properly will be determined pretty much by the turnout at the reunion. We sincerely hope that all those who look forward from year to year to these class get-togethers will find no obstacles in their paths this year to keep them from being with us. For those who haven't been to one of our group gatherings for a long time, or have never been and are wondering if they will recognize anyone, or if anyone will recognize them, come along and put us to the test.

Before closing this column, we would like to call attention to an item that appeared recently in the Brockton, Mass., newspaper announcing the election of George I. Crowell to the position of vice-president of the Campello Co-operative Bank in Brockton. Congratulations, George. The article also carried a little background material on George which should be of interest to members of the Class and we quote it as follows: "George I. Crowell is the owner of T. F. Crowell and Sons, contractors. He is a director of the Home National Bank and vice-president of the Peoples Savings Bank and also a member of the bank's board of investment. He is a charter member of the Kiwanis Club, a member of the Chamber of Commerce and St. George Lodge, AF and AM. The Crowells reside at 80 Fairview Avenue. They have three sons, G. Robert, Bruce E., and Craig E. Crowell." Anyone having financing difficulties might do well to get on the right side of George.

That does it for another month. We'll be looking forward to seeing many of you fellows early in June for our big week end, and for those who can't be present we promise a report in this column of the activities on that week end. Help us with your letters. — RALPH A. FLETCHER, Secretary, Post Office Box 71, West Chelmsford, Mass. HAROLD F. DODGE, Assistant Secretary, Bell Telephone Laboratories, 463 West Street, New York, N.Y.

• 1917 •

There is complete lack of news on the 1917 front. Your class Secretary writes en route to Florida where there is warm sunshine and relaxation — perhaps this will

explain my lack of ambition to dig up a lot of special material that will be sent to you in succeeding months. The word you had from Win McNeill should serve for another month or two — RAYMOND STEVENS, Secretary, 30 Memorial Drive, Cambridge, Mass. FREDERICK BERNARD, Assistant Secretary, 24 Federal Street, Boston 10, Mass.

• 1918 •

In the process of building a peaceful and happy social order, to say nothing of running life at full throttle, we have news of several classmates. From Panama City, Fla., Jim Ricketts writes, "For years I have been yearning to get back to a reunion, and have never been able to get there. Again I yearn, for I would like to renew friendships and see the latest developments in Cambridge. The place must have doubled in size since we were there. As for personal details, I have a daughter, a son, and each has made me a grandpa once so far. I joined the Air Material Command in July, 1941, as a civilian in Aircraft Parts Supply, and began uncorking bottlenecks all over the place. Incidentally the first jet plane parts in the country passed through my department. In 1949 I resigned in order to have a much needed vacation. Being on call 24 hours a day, seven days a week, for almost four years nearly wrecked my nervous system. For two years I motored around 46 of the 48 states, and finally settled in Panama City. When Korea erupted I went back to Dayton to the Cataloguing Administration (of airplane parts) for a year, but have been home since, and now consider myself permanently retired. You asked about patents in your letter. I lost two good ones now in use on all airplanes. I was so anxious to have the parts made and installed I forgot to patent the idea. Well, I am not shaken by little fears, but look forward with contentment."

Herbert Larner, with equally clear perspective of what matters and what doesn't, writes from the bright sunshine of Montclair, N.J., "Lillian and I certainly plan to attend the reunion at Weekapaug if we never get to another one. Ned Longley and I were recently talking about this very matter. Ned lives near me you know, and incidentally, should be able to give you a lot of interesting information because he and his wife have just a few weeks ago returned from Europe after spending three months there. Regarding myself, I work for the M. W. Kellogg Company which designs and builds petroleum processing equipment. I am married, have one daughter, Sally, and no grandchildren. In the matter of political preferences, I like Ike. I have written a few little pieces for journals but am no author. I have a couple of patents not worth mentioning. My public service is all in the past. At one time I was a member of the United States Public Health Service, so I feel that I have done my duty along those lines. In the matter of hobbies, I like to travel, am interested in antique furniture and old houses, and have so many unfulfilled ambitions that I cannot begin to tell you what they are. Insofar as plans for retirement are concerned, I repeat a statement made by a grand old gentleman, the founder of my company, who said, 'Boys, I am never going to retire until I am dead. . . .'"

An article in the Boston *Traveler* of January 23 had this to say, "Poking into the sometimes sensitive differences between religious and scientific thought can be a good way to start an argument. That possibility hasn't deterred the coauthors of an article in the current Technology Review, edited at Massachusetts Institute of Technology. The article, which may be of interest to clergy and others who can find access to a copy of The Review, is entitled, 'The Two Philosophies.' Its authors are F. Alexander Magoun, well-known human relations consultant, and the late R. Carter Nyman, also an expert in industrial relations, and first personnel director of Yale University."

By virtue of the fact that the government sends many young officers to M.I.T. for instruction in all sorts of things, though principally Naval Architecture and Aeronautics, we have classmates few of us ever got to know. Among them was R. Ranney Adams, who was graduated as honor man from the Naval Academy in 1915 and subsequently became identified with 1918 at the Institute. During World War I he was superintendent of the shops at the New York Navy Yard. He resigned from the Navy in 1919 and through a variety of positions finally reached the presidency of the Grace Lines in 1945. Last January he died. — GRETCHEN PALMER, *Secretary*, The Thomas School, The Wilson Road, Rowayton, Conn.

• 1919 •

Brian O'Brien is now vice-president in charge of research of American Optical Company, with headquarters at Southbridge, Mass., and will direct a broad-scope research program in all phases of optics and their application to the products of the company. Dr. O'Brien has taken a leave of absence as Director of the Institute of Optics and as research professor of physics and optics at the University of Rochester, since 1930.

Dr. O'Brien is president of the Optical Society of America, which in 1951 awarded him the Frederic Ives Medal for distinguished work in optics. He is the author of more than 50 scientific articles on a wide range of subjects. He also holds the United States government's Medal for Merit for his war work. A pilot himself, he devised many ingenious optical instruments to facilitate vision and detection, and also made important contributions to the aircraft and air training program in vision and fatigue. He was a sectional chairman of the National Defense Research committee.

He is also vice-chairman of the Division of Physical Sciences, National Research Council, and a member of the American Geophysical Union, and of Sigma Xi; a Fellow of the American Physical Society, the American Association for the Advancement of Science, and the American Institute of Electrical Engineers.

Walter A. Stewart, president, American Optical Company, said in a statement issued with the announcement of Dr. O'Brien's appointment: "We are proud to have a man of the ability and renown of Dr. O'Brien associated with American Optical Company."

Dr. O'Brien will make his home in Pomfret, Conn., with his wife, Ethel Dicker-

man O'Brien, herself a scientist in the field of optics and coauthor with her husband of a number of important papers. Their son, Brian O'Brien, Jr., is a research physicist in Pennsylvania and is a member of the Class of 1949.

Maurice Goodridge is chairman of the May 8 Ladies' Night program of the M.I.T. Club of Central Massachusetts.

Wayland S. Bailey has joined the Arthur D. Little, Inc., mechanical division at their new building in West Cambridge. He had been a project engineer with the Kinney Manufacturing Company of Boston and formerly was on the faculty of M.I.T., where his principal interests were in the fields of applied mechanics, strength of materials and testing materials. While on the faculty of M.I.T., he developed, built and used machines for testing window-cleaners' safety equipment, in co-operation with the Safety Council of the Massachusetts Department of Labor. He is a member of the American Society of Mechanical Engineers, the American Society of Testing Materials and the American Society for Metals.

We were glad to have a letter from George Michelson. He is in the construction business in Boston and finds that it, along with his many communal activities, keeps him very busy. One of his daughters will be graduated from Mt. Holyoke College this summer, a son is finishing his sophomore year at Trinity in Hartford, and another daughter is almost ready to enter high school. George sends regards to all.

A card from Ernest Perkins tells us that he is Treasurer of Deering Lumber Company, Inc., Treasurer of the Melrose, Mass., Lions Club, and Director, Melrose Co-operative Bank. For the past year William Osgood has been on leave of absence from the Illinois Institute of Technology acting as editor of a monograph on residual stresses that the National Research Council is putting out. He is about to return to 5236 Cornell Avenue, Chicago 15, Ill.

Holden Priest this past year has done some interesting pioneer work in heat reclamation in the tanning industry for The Patterson-Kelley Company, Inc. He says he would like to swap yarns with classmates engaged in the heat transfer field. His address: 171 Overlook Road, Arlington, Mass.

J. Pickering Putnam writes that he is working on an Air Force project at the Instrumentation Laboratory at M.I.T. His principal sport is flying.

R. B. MacMullin, senior partner of R. B. MacMullin Associates, consulting engineers in Niagara Falls, N.Y., conducts a business, associated with five other technical men, serving the chemical, electrochemical and similar fields.

Your Secretary visited M.I.T. on Friday, February 27, in order to introduce his son, Chips, to the Admissions and to give him an opportunity to inspect the campus. Both father and son had a very enjoyable visit and were quite impressed with the new library, the Faculty Club, the swimming pool and many of the new modern facilities.

Have you made your plans for attending our 35th Reunion next year? — EUGENE R. SMOLEY, *Secretary*, The Lum-

mus Company, 385 Madison Avenue, New York 17, N.Y.

• 1920 •

Al Fraser, noted floral engineer, has moved to 20 Dover Road, Wellesley. Our able and popular classmate, Dr. Lauren B. Hitchcock, has moved from New York City but is still active in the dairy industry as head of the National Dairy Research Laboratories, Inc., Oakdale, N.Y. Harry Kahn, the famed ceramic engineer, has moved to Uxbridge, Mass. Ray Perry has an interesting new address, the Smoke Rise Club, Butler, N.Y. Irving Wilson is now in Lynnfield Center, Mass., address 538 Lowell Street.

Perk Bugbee tells me that his long-time associate in the National Fire Protection Association, Ray Bond, will make a top-notch Alumni President. Knowing Ray and having seen him in action, I can heartily second the motion, but I can also assure him that he'll have to go some to equal the fine record of our recent classmates in this office, Ed Ryer and Al Glassett. — HAROLD BUGBEE, *Secretary*, 7 Dartmouth Street, Winchester, Mass.

• 1921 •

Writing from his home in Havana, Cuba, Helier Rodriguez sends a most welcome letter, saying that he will continue his unbroken record of many years standing and be present at the annual 1921 party in Boston on Alumni Day next month. He adds: "Since I came back from the reunion last year, I have been quite busy finishing the construction of our new theatre, the 'Rodi,' which opened last November. Now we are trying to finish our new home. President Jim Killian '26 and Mrs. Killian were here at the end of January with Dr. Robert S. Harris '28 and Mrs. Harris. Graciela and I showed them around the city and had luncheon and dinner with them, besides attending the official dinner meeting of the M.I.T. Club of Cuba at the Havana Country Club. Dr. Killian went from here to Mexico City to attend the annual fiesta of Mexican alumni. (Manuel S. Vallarta was on the fiesta committee of arrangements—Cac.) Dr. Harris, Professor of Biochemistry in Technology's Department of Food Technology, is technical director of a newly-established laboratory for the Foundation for Medical Investigations which will investigate the nutritional value of local foods. Robert S. Cook of Canandaigua, N.Y., a member of our Class, arrived in Havana early in March with Mrs. Cook. They were on a cruise of the S.S. *Italia* through Caribbean waters. Graciela and I took them to lunch at the Havana Yacht Club and drove them around the city and suburbs to show them as much as possible in the short time they were here. Bill Sherry wanted us to go to the Mexican alumni reunion and wrote that he was taking Margaret, but it was just at the time when the sugar cane crop was beginning to come in, which is a most busy time for me and I could not get away. We often look at the movies we have made on our trips north and the one we made of you, Maxine and Eleanor last time came out very well." Helier sends regards to everyone.

Ed Farrand is continuing to do a bang-

up job as 1921 Class Agent and you will no doubt have heard from him by the time these notes reach you. For M.I.T.'s sake as well as to continue receiving The Review and thus reserve your spot in this monthly gathering around 1921's hearthstone, please act on Ed's suggestion at once. Lincoln B. Barker advises that his mail should now be sent to Post Office Box 546, Schenectady, N.Y. Linc is associated with the General Electric Company. Robert B. P. Crawford, a lieutenant commander in World War II and since then the sales manager of Buildice Company, Chicago, is back in the Navy as a commander. Currently, his address is AINSMAT, 536 Middlefield Road, Redwood City, Calif.

Norton G. Raymond is engineering supervisor of the Ex-Cell-O Corporation. He reports a new home address at 6438 Trumbull Street, Detroit 3, Mich. He and the late Mrs. Raymond have three daughters. Mrs. Irving Whitehouse, the former Helen C. Lord, reports an address change to 4409 Renwood Road, which is appropriately located in Cleveland 21, Ohio. Arthur N. Brambach of International Business Machines Corporation, has a new home address in Burlingame, Calif. Merritt F. Farren is the manager of Old Sturbridge Village in Sturbridge, Mass. New addresses have also been received for Paul L. Deylitz, Robert B. Frost, Charles E. Mendinham, Elmer L. Oliver, Admiral Lawrence B. Richardson and Colonel Girard B. Troland. A letter from Foster P. Doane, Jr., '20, inquires about the address of his former Arlington, Mass., high school and Army pal, Harold O. Bixby, a Regular Army colonel who retired from the Signal Corps in 1946 after 25 years of service. The last we heard from Bix was a post card from Pakistan saying he couldn't be at the 1951 reunion. Between jaunts all over the world as a consulting engineer, he makes his home in St. Thomas, V.I.

Joseph L. Gillson, geologist for E. I. du Pont de Nemours and Company, Wilmington, Del., has been named to the mineral economics division, American Institute of Mining and Metallurgical Engineers, of which he is also a vice-president and director. Joe is another globe trotter, who can be found at home at 109 Mullin Road, Wilmington, between trips. William B. Plummer, President of Indoil Chemical Company, Chicago, a subsidiary of Standard Oil Company of Indiana, is widely known for his research work in the petroleum field. Bill received his bachelor's degree with us in 1921 and his master's degree at M.I.T. a year later, following which he joined the Grasselli Chemical Company and later the Combustion Utilities Corporation. He became associated with Standard of Indiana in 1930 and served in various capacities, including those of manager of development and patent department and manager of the chemical products division, until election to his present position. He is married and has no children. Foster M. Post of Santa Monica, Calif., is the owner of a furniture manufacturing company of the same name, also of Santa Monica. He is active in Rotary and reports seeing Roy and Mrs. Snyder. The Posts have a son in the Air Force and a daughter at

Stanford.

Thomas W. Proctor is senior structural test engineer for Glenn L. Martin Company and makes his home at Darlington, Md., where he owns and operates a model livestock farm. A member of the American Society of Civil Engineers, he reports occasional meetings with Dug Jackson and Whit Spaulding. The Proctors' son, Ben, is at school in Baltimore. Charles W. Richards is assistant manager of the International Paper Company, York Haven, Pa., and active in the Technical Association of the Pulp and Paper Industry. Dick and Mrs. Richards have one son who is a junior at Carnegie Tech. Holland L. Robb, a colonel in the Corps of Engineers, is professor of military science at the University of Pittsburgh. He and Mrs. Robb have two daughters. Walter S. Ross is a member of the technical staff, Bell Telephone Laboratories, New York City. He is a member of the American Institute of Electrical Engineers and devotes spare time to his hobbies of photography and wood working. Both daughters are married and granddaughter Carol is three years old.

Our literary stalwart, David O. Woodbury, breaks a long silence with one of his sparkling letters direct from the home that Woodburys built at 513 Knight Way, La Canada, Calif. Says Dave, in part: "I am engaged mainly on two fronts, first as a corporation president, general manager, accountant, tax expert, production manager, design engineer, machine tool operator, office boy and advertising manager; and second as a writer. This should be enough for any M.I.T. man. It certainly is for me. In the first category, I function as the head, body and tail of our small outfit known as Creative Research, Inc., engaged in the difficult process of developing inventions for the market and then marketing them. We are a group of 50-odd (and odd) engineers, mostly from nearby industries. We thought we had enough good ideas to make an easy million the first year. We haven't. We do not possess any capital, either, and we operate in high or low gear according as I am able to extract many or few 'dues' from the members.

"Nevertheless, we are running in the race and in sight of the tape. Our one and only product of any value is a small hand tool for de-burring metal and plastic edges, especially the edges of holes. We find that there is no such hand tool on the market, other than old files or jack knives, so we anticipate a good market. The tool is the invention of a machinist we ran into and I have spent a year developing it, almost single-handed. The inventor had a working model with six parts. I managed to reduce it to three, cut the manufacturing cost, designed packaging, and am now ready to take orders. Our commercial manager (the only official who isn't me) believes he can sell upward of ten thousand a month when we get started. Orders will be welcomed by mail, wire, television, pony express or thought transference!

"On the writing front, I am engaged in collaborating on a book with an engineer who has a terrific story about Indo-China. This project should be terminated this spring and we hope to burst into print

soon thereafter with a lurid tale of foreign boondoggling, financial misgeneration and plain graft which, in the case of Indo-China, has led straight to communist capture of the country.

"Another project of mine was viewed by the public in the March issue of *Reader's Digest*, wherein I expounded the virtues of the new Hack shoe, a revolutionary application of energy storage and release purported to make walking some 40 per cent less work. Mr. Hack, a retired Detroit shoe manufacturer, is something of an inventive genius and is already swamped with bids for contracts from other shoemakers. The Technology Review and I had a decisive hand in bringing this about. I printed a short piece in The Review about a year ago under the title 'The Shoe That Does Your Walking For You.' To my amazement, and in spite of the somewhat restricted readership of the Review, Hack was flooded with inquiries about his shoe. The article led to an editorial in the *Christian Science Monitor* which was reprinted all over the country. The *Digest* fell in line shortly after. The Hack 'ripple sole' seems to be a genuine advance in footwear, especially for occupational wearers such as postmen, golfers, and so on. Outside of these items, I have nothing to report, beyond having invented and marketed the 'Porto-Box,' an automatic sluice for gold seekers who are too lazy to use the old-style pan." We're still laughing at Dave's story of personal experiences with a Van de Graff electrostatic generator, which appeared in the May, 1951, issue of *Reader's Digest*, under the title of "How to Build a Lightning Machine." It is a true story of the exploits of Dave and his son, Christopher, in a Bronxville, N.Y., apartment! Dave would be glad to know that a much-thumbed volume in our technical library is his book *Battlefronts of Industry*, a publication which may be of interest to the class and other readers of this column.

As the Alumni Association year draws towards a close, it is interesting to review the roles which many members of 1921 have played, as revealed by the annual directory. Chick Kurth is our representative on the Council and four others represent alumni clubs: Josh Crosby, Bangor; Mel Jenney, New Orleans; Frank Kit tredge, Monterrey; Ace Rood, Indianapolis. Mich Bawden is an associate member. Ray St. Laurent is our class president, your scribe is secretary-treasurer and Ed Farrand is class agent. Whit Spaulding is president of the M.I.T. Association of Baltimore; Buck Buckner is a vice-president of the M.I.T. Club of Central Pennsylvania; Helier Rodriguez is Review secretary of the M.I.T. Club of Cuba; Ed Praetz is president of the M.I.T. Club of the Merrimack Valley; Joe Wenick is treasurer of the M.I.T. Club of Northern New Jersey. Elected by the M.I.T. Corporation to serve on departmental visiting committees are: Admiral Homer N. Wallin for Course XIII; Arthur E. Raymond for Course XVI; Bill Sherry for the Division of Industrial Cooperation. Members of the Educational Council of the Institute include: Ed Farrand, Albany, Ga.; Harry Field, Honolulu, Hawaii; Jack Barriger, formerly Chicago; Whit Spaulding, Baltimore; Cac Clarke, Munnie Hawes,

Sumner Hayward and Ed Lockwood, New Jersey; Irv Jakobson and George Welch, New York; Ray Snow, Raleigh, N.C.; Bill Sherry, Tulsa; Glenn Stanton, Portland, Ore.; Si Freese, Fort Worth; Gene Rudow, Seattle; Charlie Manneback, Brussels, Belgium; Helier Rodriguez, Havana, Cuba. The late Charles H. Herty, Jr., was serving in Bethlehem, Pa. Warrie Norton is listed as a past president of the Alumni Association.

Twenty-one were around the 1921 tables at the midwinter meeting of the Alumni Association to hear, among others, our own Ed Schwarz, Professor in Charge of Textile Technology at the Institute, illustrate the properties of new fibers and fabrics with an excellent selection of demonstrations. Among those in the group were: Elly Adams, Colonel Charles Baish, Jack Buckley, Scott Carpenter '20, Josh Crosby, Chick Dube, Harry Goodman, Roy Hersum, Joe Kaufman, Chick Kurth, John Mattson, Melvin Mattson '54, Harry Myers, Phil Nelles, Bob Parry '41, Herb Reinhard, Jack Rule, Steve Seampos, George Schnitzler, Ted Steffian, George Thomson. The University of Tennessee's head football coach, Brigadier General Bob Neyland, has asked to be relieved on advice of his physician. The famous coach, who has trained many other well known coaches such as Hickman, will continue as the university's athletic director.

It is with profound sorrow that we learn of Ray and Helen St. Laurent's great loss in the passing of Ray's mother after a long illness. We know her many friends in the Class join us in an expression of sincere sympathy. A note from Joseph W. Gartland, -National Carbon Division, Union Carbide and Carbon Corporation, Cleveland, Ohio, tells of his participation in the conference on coal of the American Association for the Advancement of Science last year. He gave a paper on "X-Ray Studies of Coal and Carbon During Graphitization." Joe reports seeing Bill and Mrs. Loesch at that time and says their daughter, Norma, had just been married and their son, Robert (M.I.T. '50, Naval Academy '51), was en route to take part in Operation Mainbrace. Joe says his son, Peter, will graduate from Dartmouth next month and is planning to enter Harvard Law School. He thoughtfully enclosed a number of clippings from Cleveland papers and trade journals, telling of the successful progress of the Colton Chemical Company of which H. Seymour Colton is president. A new Cleveland plant was opened last year for the production of polyvinyl alcohol.

Saul M. Silverstein, President of Rogers Corporation, Manchester, Conn., was a guest speaker at the meeting of the Boston Stein Club which announced new scholarships for M.I.T. freshmen and for members of Technion, the technical institute of Israel, to come to M.I.T. for study. In the nine months since Saul and Regi returned from the trip to Belgium, where he served on a Mutual Security Administration team, Saul has spoken to some 20 groups including Kiwanis, Rotary P.T.A., League of Women Voters, numerous men's and women's church groups, as well as engineering, management, personnel and economics associations and new M.S.A. teams.

It is with heavy heart that we report the death of Albert Eugene Povah of Manchester, Mass., on March 6, 1953. Born in South Boston on December 3, 1897, he prepared for Technology at Chauncy Hall School. At the Institute, he was a member of the Mechanical Engineering Society, Catholic Club, Chauncy Hall Club and the baseball team. He was graduated with us in Course II and became associated with the late Lou Hurley in the contracting and engineering of heating, piping, air conditioning and power plant equipment. In 1944, Al became the owner of J. J. Hurley and Company of Boston. He was a member of the Massachusetts Society of Professional Engineers and a member of the Board of Registration of Professional Engineers and Land Surveyors of the Commonwealth of Massachusetts. He is survived by his wife, Mrs. Pauline Semons Povah, and a daughter, Jane S. Al was a regular attender at all 1921 functions and he will be sadly missed by his many friends in the Class. On behalf of all, sincerest sympathy is extended to his family.

This is your invitation to attend the 1921 annual social gathering at the Statler Hotel in Boston, just before the evening Stein Banquet on Alumni Day, Monday, June 15, 1953. Exact time and room number will be posted on the 1921 registration list in the Rogers Building lobby and on the Statler bulletin board on Alumni Day. Come and join in the fun and good fellowship. — CAROLE A. CLARKE, Secretary, Federal Telecommunication Laboratories, Inc., 500 Washington Avenue, Nutley 10, N. J.

• 1922 •

We lost George Prout in March after an illness of only two weeks. George went his own quiet way in school, but he was up there at the finish, being vice-president of General Electric and one of the top officials in his company's atomic energy department. He had a long steady 30-year climb through many of the company's divisions. By 1927 he was petroleum industry specialist, senior motor and industrial control specialist. In 1929 he won the Charles A. Coffin Award for his work in the petroleum industry. In 1939 after having been southwestern district industrial manager, he went to Schenectady as sales manager of the industrial control division moving up to manager in 1941. Then, in 1944 he went to Bloomfield, N.J., as manager of the air conditioning and commercial refrigeration divisions and a year later was general manager of the air conditioning department. Promotion to vice-president of the company quickly followed later that year. Since 1948 he had been engaged in nucleonics and atomic energy, serving as assistant general manager and then general manager of the nucleonics department and was a member of the committee which directed all work in atomic energy research and development being conducted by G. E. for the Government. His premature death at age 53 is a great loss. Our sympathy is extended to his widow, his son and daughter.

Rev. Lester Clark Lewis was installed as the first minister of the Unitarian Society of New Haven at ceremonies held

in the Center Church on the Green last January.

"The Early Train," a water color painted by Catherine Spencer Goodnow, John Goodnow's wife, was hung on March 27 with appropriate ceremonies in the new Greenbush, Mass., railroad station of the New Haven Railroad. The picture, 20 x 30 inches, showing the old station and a train with a steam locomotive, was painted in 1938. The unveiling was attended by railroad and Scituate officials and other interested fellow citizens. Harvey Williams was recently appointed to the executive committee of the Board of Directors of H. J. Heinz Company, Pittsburgh. He is vice-president in charge of overseas operations, responsible for the Heinz subsidiary companies operating outside North America. Late in January Harvey left on his seventh trip to Australia since the end of World War II.

New Address: Charles G. Rudderhan, 847 Eldora Avenue, Post Office Box 1251, Clearwater, Fla. — C. YARDLEY CHITTICK, Secretary, 41 Tremont Street, Boston 8, Mass. WHITWORTH FERGUSON, Assistant Secretary, 33 Ellicott Street, Buffalo 3, N.Y.

• 1923 •

Still the most important item of class notes is about the forthcoming 30th Reunion. Sixteen members of the Reunion Committee met at the Faculty Club at Tech on February 28 and a good many of the details of the program were thrashed out at that time. A good many others have subsequently been taken care of (These notes had to be prepared early in March). At about the same time you see these notes you should have received a mailing giving the latest data about the Reunion plans. You must respond to this mailing in order to make reservations for the party.

The 30th Reunion Program will fall into two general parts. The first of these will be the Class Reunion itself which will be held at the Sheldon House, Pine Orchard (near New Haven), Conn., beginning Thursday night, June 11, and continuing through Sunday morning, June 14. The second phase of the celebration will be Alumni Day at Cambridge and Boston, Monday, June 15. It is to be hoped that many of you will be able to make both phases of this anniversary celebration.

Reunion plans have progressed to the point where I can give you a run-down of the events which are scheduled.

The Class Reunion starts on Thursday, June 11, to provide a day which will be principally devoted to your getting to Pine Orchard. If you come by car, you can drive directly to Pine Orchard. If you come by train, the connection is at New Haven or Pine Orchard and taxi to the Sheldon House. Room registration will be handled on arrival during the afternoon. Advance reservations must be made with the Reunion Committee. Late-comers will have to take their chances that accommodations will be available. Dinner will be informal.

On Friday, June 12, breakfast, luncheon and dinner will be informal. Near the Sheldon House there is a fine small golf course and there is plenty for the ladies to do. It is probable that there will be a

good deal of sentiment in favor of a lot of sitting and visiting. An informal entertainment program is scheduled for the evening which will positively include the showing of a film record of the graduation exercises of the Class. A real job has been done to assemble all the film shots possible, not only of the graduation but of subsequent reunions. Bring any shots you may have.

Saturday, June 13, breakfast and luncheon will be informal and there will be recreation facilities throughout the day. There will be an opportunity to play golf (probably a class tournament), go swimming, play bridge, or do other things which appeal to you. A treasure hunt is being worked up.

There will be a banquet in the evening (informal dress). President R. P. Shaw will be in charge. A number of guests have been invited including Dr. Karl T. Compton, H. S Ford ('23 honorary), H E. Lobdell '17, Executive Vice-president of the Alumni Association, and perhaps one or two others. There will be a short business meeting of the Class, at which the Nominating Committee will report, and the induction of new officers. As at the 25th, this evening will probably wind up with the award of door prizes.

Members who are going to bring prizes for presentation or distribution at this time should get in touch with either J. H. Zimmerman or D. B. Joy. Both may be reached at 30 East 42nd Street, New York.

Sunday, June 14, breakfast will be informal, as usual, and there will be the recreation facilities available throughout the day. Finals in any games or tournaments will be played. At luncheon, sports prizes will be awarded. Rooms reserved for the Reunion period will be vacated at each person's convenience after luncheon.

Channing P. Clapp is general chairman of the Reunion Committee, 210 Main Street, Matawan, N.J., phone Perth Amboy 4-3380 (business) or Matawan 1-1762 (home). David W. Skinner is handling reservations. Dave's home address is 448 Quinobequin Road, Waban 68, Mass., phone Kirkland 7-8930 (business) or De-catur 2-2770 (home).

You make your own arrangements for hotel reservations you may require when you come to Boston for Alumni Day. For Alumni Day events, you also make advance application for tickets directly to the Alumni Day Committee of the Alumni Association, not to the class committee. Also, you reserve tickets for ladies and others who will be with you.

The events at Cambridge and Boston begin Monday morning, June 15, at the Institute in Cambridge. You register in the lobby at any time after 8:30 A.M., and pick up tickets for Alumni Day events which you have previously reserved. The program for Alumni Day events will come to you from the Alumni Association. If you have ladies with you, you may bring them to the Emma Rogers Room in Building No. 10, which they may use as a base during the day, where they will be in touch with the hostesses of the Alumni Day committee and where they can arrange to participate in various events for the ladies.

Luncheon at the Institute will be at 12:45 P.M., when the 30-year class will

gather around one of the tables provided. Be sure and bring the ladies to this luncheon. Alumni Day includes an afternoon program but the most important event is an informal assembly of the members of the Class and their ladies prior to the Alumni dinner. At the Hotel Statler, check the bulletin board for the number of a room reserved for us. Drop in any time, 4:00 to 6:45 P.M. Try to make this informal assembly, even if you are unable to make the other Reunion events.

The Alumni Association will announce the program of the Alumni dinner. There will be a 30-year class table and souvenir steins. Arrangements for the ladies will be announced in the Reunion Program.

Doesn't this run-down sound pretty good? Hope you can take in all or part of the events.

In spite of the fact that most of the notes this month are taken up with this resumé of the Reunion plans, there are a few personal items, Professor Edward R. Schwarz, '21 head of the M.I.T. division of textile technology, combined a magic show with a discussion of fibers and fabrics, as one of the features of the annual Mid-winter Meeting of M.I.T. Alumni at Walker in February. — Hyman T. Marshall is owner of the Marshall Oil Company, Quincy. He reports that his daughter, Ruth, completed Radcliffe College with an A.B. degree and two years of Harvard Law School. She was married last June and is living in Arlington, Va., and finishing her law course at Georgetown University.

This is the last set of notes, but one, which I expect to have the chance to prepare. This circumstance is perhaps sufficiently explained by the announcement, elsewhere in The Review, of my nomination as president of the Alumni Association for the coming year. The class nominating committee, which will report at the Reunion, will recommend a new class secretary. At this writing, I do not believe the nominating committee has made a choice.

I have enjoyed fine co-operation from the members of the Class and it has been a pleasure to serve. This will be an opportunity to extend my thanks to members of the Class who have faithfully responded to various mailings and otherwise have helped to make the Secretary's job pleasant and effective. — HORATIO BOND, *Secretary*, National Fire Protection Association, 60 Batterymarch Street, Boston 10, Mass. HOWARD F. RUSSELL, *Assistant Secretary*, Improved Risk Mutuals, South Broadway, White Plains, N.Y.

• 1924 •

By this time you will have received George Parker's letter, his "Annual Report," and you will know that plans are already being made for our 30th reunion. It's only a little more than a year away and we'll bet that, barring some major disaster, few of those who were at the 25th will miss this one. Nothing definite yet on where, but the when is pretty well set, the week end before June 14, 1954. That's the date of Alumni Day. If you're a long-distance planner — and people like Dolph Santos, Royce Greatwood and Jimmie Wong have to be — this just might be a timely piece of information.

George Parker stopped off in Boston recently for a get-together with Pret Littlefield and your Secretary. George was en route to Washington after a week end at home in Newburyport. His charming wife Madeline and two of the girls were with him, providing transportation to the airport. George says that Vin Cates, who recently joined his organization, has come up to Boston to Anderson-Nichols' home office. He was also authority for the news that Charles A. Thomas has recently been appointed to the National Safety Council.

Our Vice-president, Prescott H. Littlefield, was in Boston for a week end of fraternity business, and probably pushing a bit of Canada Dry products on the side. Matter of fact, the Somerset almost had an upheaval when room service delivered a couple of bottles of White Rock to his room. However, Pret succeeded in downing some of the competition's product without noticeable ill effects. At a recent American Management Association meeting he had the pleasure of listening to a discourse by Harvard Business School's President, Edward J. Hanly.

Recent visitors included Charles R. MacBrayne and Andrew P. Kellogg. Charlie, on from Chicago on a combined business and pleasure trip, stopped in all too briefly to say hello. Andy had planned things better and we spent a very enjoyable evening at the Faculty Club. His paper, the Schenectady *Union Star*, is currently without an editor, so Andy is doubling in brass on both the business and editorial ends.

We've lost another member of the Class, this time of his own volition. John L. Liecty started with the Class of 1922 but finished with us. Why anyone should want to move backward, or anywhere out of '24 is inconceivable, but that's just what Jack has done. Sorry to lose him.

Warren E. Hill, the former toothbrush king, has a new position. He is now vice-president in charge of operations of the Emhart Manufacturing Company in Hartford. Another business note: Roger Cutting has joined the Holbrook Office in Boston, private trustees and financial counsel, as a trustee associate. Also a judicial item; our distinguished classmate, Mr. Justice Arthur Tyndall of the Court of Arbitration, New Zealand (roughly similar to the United States Supreme Court) is now in this country. In March and April he delivered a series of four public lectures at the Institute on Compulsory Arbitration of Labor Disputes in New Zealand. Another honor for William H. MacCallum, Jr. — William is now an honorary secretary in Los Angeles.

In the line of military intelligence, unclassified, is the retirement of Major Albert W. Stevens from the Air Force. Kip is living in Asheville, N.C. Rear Admiral John H. Carson has been transferred from Washington to San Francisco, and Colonel John V. Weaver has gone overseas with the 6610th Air Base Group. Wish we could tell you more of what these men are doing, but further information is lacking. Walter Weeks has left Connecticut for the Blue Grass State. He's living in Louisville. Samuel E. Cotter moved north to keep our Connecticut score even. He has settled in Stratford in a place with the fascinating name of Chickadee Lane.

Many of you will remember Murray Horwood'16, Professor of Biology and Public Health in our day. He is now in Burma, heading an educational mission, and ran into one of our classmates while on a holiday in Thailand. Civil Engineers especially will remember Soonchong Punyagupta, but probably not under his present name. Seems the King of Thailand didn't like it and changed it to Luang Videt. He's now chief engineer for the State Railways of Thailand, "a very important and responsible position," says Murray. His wife Sompong just presented him with another child to keep their first, Tum-tum, company.

That's it for now, except for two reminders: Alumni Day is on June 15 this year; and if you haven't yet contributed to this year's Alumni Fund, now is a good time to do it. We still have a bit to go to equal last year's total, and Frank Shaw is biting his finger nails anxiously. — HENRY B. KANE, General Secretary, Room 1-272 M.I.T., Cambridge 39, Mass.

• 1925 •

Last month we mentioned the passing of Daniel Gurney and since that time we have received a newspaper clipping which mentions somewhat the activities that Dan has been engaged in, and it seemed as though these would be of interest to Dan's classmates. At the time of his death, he was vice-president and director of engineering at the Marlin Rockwell Corporation in Jamestown, N.Y. He had lived in Jamestown most of his life and won honors both on a national and local level for his technical knowledge in the engineering field. He was a recognized authority on anti-friction bearings. As a member of the city's Board of Public Utilities his technical know-how was called upon in many instances during the construction of Jamestown's multimillion dollar power plant addition which marked a new era in electrical progress here. For two years he served as a member of the subcommittee on lubrication and wear, a group of the National Advisory Committee for Aeronautics, composed of civilian authorities contributing their professional knowledge in research programs aimed at preserving America's air strength.

Dan took graduate work in electrical engineering at M.I.T. following his undergraduate studies at Oberlin College. From 1923 to 1929, he was connected with the Marlin Rockwell Corporation in the engineering department. He left to go with the Bell Telephone Laboratories for research work in sound movies in New York City, from 1929 to 1930. Later in 1930, he was associated with Technical Motion Pictures. Between 1930 and 1938, Mr. Gurney held a position with the Landis Tool Company, Waynesboro, Pa., where he designed machinery for the manufacture of ball bearings much of which is in use today in the ball bearing industry. His engineering talents were recognized nationally. He served on the Coordinating Research Council, a national group concerned with roller bearings and lubrications. Dan was also active on the Coordinating Lubricants and Equipment Research Committee and also served on the Annular Bearing Engineers Committee, the Roller Bearing Engineer

Committee of the Anti-Friction Bearing Manufacturing Association, the Society of Automotive Engineers, the American Society of American Tool Engineers and cooperated in the work of the American Standards Association and the American Ordnance Association. He was a member of the Jamestown Chamber of Commerce and the University Club, serving as president of the latter group last year.

Notice has been received of the death of Myrtle R. Peck, II, at Hadlyme, Conn., on January 21, 1953. We have no details.

An interesting article appeared in the Hartford, Conn., Sunday *Courant* a few weeks ago describing the development of a new machine by Fred W. Cunningham, VIII. The machine will do the job of gear cutting of unusual shapes and classifications that for centuries have been what is called "mathematical curiosities." The machine and procedure speeds the day when factories can become more completely automatic. Fred has, for the past 19 years, been associated with Arma Corporation, an American Bosch Corporation subsidiary.

Two interesting changes of address have been reported by the Alumni Register but no details are available as yet. Harrison Browning, II, reports a new address with the Carma Manufacturing Company of Arizona, 3544 East Fort Lowell Road, Tucson, Ariz., while Lieutenant Colonel R. J. Possiel, IX-B, who has been stationed at Fort Devens now has an APO address, San Francisco, Calif. — F. LEROY FOSTER, Secretary, Room 5-105, M.I.T., Cambridge 39, Mass.

• 1926 •

Your Secretary has had to call the editor of The Review to ask for an extension of a few days for getting in the notes, and I have been trying to figure out why, because there was an abundance of available material. The "due date" this month came on a Friday, which seemed to be a good reason for postponing this activity because class notes are always written on a week end, but when Friday came, instead of laying out a good supply of pencils and lots of paper to take to Pigeon Cove, I found myself putting the portable dictaphone in the trunk of the car. Why all this lethargy? The real answer came to light when I just noticed the "due date" was March 20. Spring has arrived!

Now that we have got underway, let's look over this mass of material and, as usual, take care of any unpleasant notices first. From a clipping we learned of the death of Arthur T. Hewlett, II, a Course X man on January 24 this year in Homer, Alaska. We have looked in the '26 *Technique* for his picture but it is not there. His most recent address in the Alumni Register has been Anchorage, Alaska, but no other details are listed. We have an Army release here which states that Major Arthur C. Fuller is now serving with the Korean Military Advisory Group and that his unit is in the U.S. Army Group that is supervising the training and revitalization program for the entire Republic of Korea Army. In checking the *Technique* for Arthur, we find his picture on the same page with that of Al French, Guy Frisbie and Tony Gabrenas and that he is a VI-A man originally from Scranton, Pa. I have some

good news for you, which was bad news when I first received it about Eban Haskell. Eban was stricken with lobar pneumonia in December, which was followed by very serious complications. Mark Greer heard about it and wrote to Jim Killian, who passed the news along to your Secretary. I have here a reply to a letter that I wrote to Eban in which he states that his convalescence is about over and after a trip south, he will be ready to return to work. Eban, as you may recall, is with the United Illuminating Company in New Haven and lives just outside in Hamden, Conn. We hope that by the time these notes get into print, we will have had an opportunity to stop off in New Haven and take up Eban's invitation to lunch or dinner and to quote from his letter, "and now that I have two girls away at college, I've got a bedroom I can offer too." We're mighty happy that this classmate who has done so much for the Class of '26 has regained his health after such a serious illness.

I suppose you have noticed the way these notes are sometimes expressed in the first person, sometimes in the third person, "your Secretary," and sometimes by editorial "we". I am just mentioning this to let you know that your Secretary is aware of it and that we plan to continue using such garbled grammar. Don't ask me why. It probably is a battle between self-consciousness and monotony. You can picture your Secretary sitting in the middle of a large divan in our living room in Pigeon Cove with the dictaphone on a chair in front of the divan, clippings all over both sides of the divan, on adjacent tables, on top of the dictaphone and on the floor and the '26 *Technique* and Alumni Register on another nearby chair. But this won't be for long, because we are fixing up a little hide-away at one end of the balcony which is going to be an ideal spot for a job like this. The room will only be about 12 feet square with a fairly low ceiling and just one window with diamond panes. It's going to be paneled with pine with recessed bookshelves in the walls, and the floor will be of polished white oak, boards containing pegs. There's going to be a closet with three shelves to take care of any class notes material, class files, photographs, Kodachrome slides, and so on. There's going to be a Governor Winthrop desk at which the class notes will be written (it really is more fun to write them longhand than to dictate), and shelves on the wall will take care of a large collection of M.I.T. steins, as well as a ship model or two. Part of the paneling of one wall will be arranged to open in order to conceal a television set in case that we ever decide that we need one down here. Don't you think that such a setup will be more conducive to writing class notes than the living room layout described above with all of its distractions, including a large plate glass window overlooking the sea? We hope that it will, and as a result, the quality of the class notes will improve starting in the fall.

Now let's get back on the track and pick up some of this information spread out here on the divan. Here's a clipping about Wes Hemeon with a two-page biographical sketch that I should have had a couple of months ago when I was writing

his thumbnail sketch. Since we have recently covered Wes' biography, we will not repeat, but we must tell you of a new honor that has been bestowed upon him. In January Wes was among 13 prominent Pittsburghers who were accorded recognition at a banquet for outstanding contributions in their particular fields of endeavor, all of whom were given certificates of achievement. Wes was selected for the award in Science as a result of his outstandingly important work in air pollution abatement, industrial dust control and ventilation. Congratulations, Wes, the Class is proud of you.

A clipping from the Springfield, Mass., *Democrat* tells us that Alden Butler has become superintendent of the American Bosch Corporation's factory at Springfield. The clipping also states that Alden has been with the company since 1928, was production manager of a plant operated by Bosch in Providence during World War II, and for the last two years has been assistant superintendent at Springfield. Alden lives in Westfield, is married and has two children. Congratulations, old man!

A short clipping tells us that "Bud" Wilbur was inducted as vice-president of the Northeastern Section, American Society of Civil Engineers in January. This reminds your Secretary that we have never written a thumbnail sketch about "Bud," one of our most outstanding classmates, and we hereby put that on the agenda.

Leon Zaitzovsky has received recognition from the Catholic Church for his outstanding work in designing and constructing several churches in the St. Louis, Mo., area, and was honored by representatives of the Catholic Church at a dinner held last fall in the crypt of one of the new churches he designed, the Church of the Annunziata in Ladue, Mo. Leon was also the chief designer of St. John's Hospital, Springfield, Mo.; Mercy Hospital, Springfield, Ohio; St. Mary of the Plains Academy, Dodge City, Kansas, and many other religious and educational structures. Leon, this is wonderful!

One more clipping and we're going to call it a day because after all, there's another month coming and we want to leave something in the reservoir. Here's one that has me a bit puzzled. It tells of the promotion of Bill Forrester to Vice-president of the Hartford Fire and Hartford Accident and Indemnity Company, but he was already vice-president of both companies. That's the trouble with being up at the top, there's no place to go. Obviously, it's a promotion and Bill must be a different kind of a vice-president than he was before, and we hope with a lot more take-home pay. Hats off to Bill!

Your Secretary recently met Cecil Ogren under most unusual circumstances, and we also had a wonderful letter from Johnny Drum. You will hear about these things next month, as well as many of the other clippings we have to tell you about. The only thing that won't wait is word about a junket planned by Ben Richardson, who lives in Old Greenwich, Conn., and is with the Electrolux Corporation. Ben is heading south and has asked for Bob Sherwood's address (which is care of Gulf States Utilities Company, Beaumont, Texas) and also for classmates' names in

Mexico City. We have written Ben to look up Carlo Arellano and Dick Plummer in Mexico. Anyone else in that general vicinity who might be on Ben's route should write him at 4 Fairgreen Lane, Old Greenwich. Ben promises to give us a report of his travels. Having filled one Dictaphone memo-belt and one longhand page I, your Secretary, and we say cheerio 'til June! Hope we will see a great many of you on Alumni Day, June 15.—GEORGE WARREN SMITH, *General Secretary*, E. I. du Pont de Nemours and Company, Inc., Room 1420, 140 Federal Street, Boston, Mass.

• 1927 •

Bumped into Bob Dexter at Chicago Airport a few weeks ago. He was singing the praises of the West Coast to which he had just completed his first visit. However, his address is still care of Barkley and Dexter, 528 Commonwealth Avenue, Boston 15, Mass. On the same trip I also saw Bud Gillies and Jack Herlihy. They are still in San Diego and San Francisco respectively.

Robert W. Berry has moved from New Jersey to Detroit where he is with the engineering firm of Giffels and Valeet, where he is responsible for refrigeration and air conditioning problems. We received a notice that Sven A. Berg has moved to Gilman Iron Works, Post Office Box 41, N.H. It turns out that this classmate was slightly older than most of us when he entered M.I.T. and retired from business in 1947. His two sons have since graduated from M.I.T.

Over the years the work of Bob Bonnar in the American Association of Textile Chemists and Colorists has been recorded in this column. It is a particular pleasure to record now his election to the presidency of this organization for 1953. At the annual Mid-winter Meeting of Alumni of M.I.T., Harold E. Edgerton demonstrated technique in electronic flash photography.

Gus Lobo, Jr., of 99 Wall Street, N.Y.C. and 83 Greenway North, Forest Hills, N.Y., has been elected vice-president of the New York Coffee and Sugar Exchange. After a two-year start with Westinghouse, he went into the coffee and sugar business and is now a member of the New York Coffee Exchange, Cotton Exchange, Cocoa Exchange, Commodity Exchange and the Chicago Board of Trade. During World War II he worked on industry problems with the OPA and WPB.

Two hundred and fifty Reunion Books have been sold, but additional copies are still available.—JOSEPH S. HARRIS, *General Secretary*, Shell Oil Company, -50 West 50th Street, New York 20, N.Y.

• 1928 •

Under the able and devoted guidance of Bill Carlisle, our 25th Reunion Chairman, plans are nearing completion for our 25th celebration—the first ever to be held at the M.I.T. campus with families. Please remember the dates: June 12, 13, 14, and Alumni Day, June 15. As these notes are being written, the scheduled attendance of men, women, and children is 147, made up as follows: 62 classmates, 47 wives, 19 sons, and 19 daughters. Unfortunately, space and time do not permit listing the

names of those who have indicated they plan to attend.

In case we have not heard from you who read these notes by the time this issue of *The Technology Review* reaches you, and it is your plan to attend the 25th, which we hope to be the case, please let us know promptly as there are many things to be done by the Committee in Cambridge to make your stay a pleasant one. A complete program of our reunion appeared in the April issue of *The Review*. The 25th is the traditionally big one; please plan to come. Yours for '28.—GEORGE I. CHATFIELD, *Secretary*, 49 Eaton Road, Larchmont, N.Y.

• 1929 •

Tempus fugit, brethren, and whether you have gray hair or not, our 25th reunion looms over the horizon. Looking forward to June, 1954, Wally Gale, currently Secretary of the Institute, called a meeting at the Faculty Club recently to organize a committee and lay plans for our 25th. Answering the call were the following: John Wilson, Eric Bianci, Chuck Worthen, Fisher Hill, Ed Farmer, Jim Fahey, Walter Gale, Carl Peterson, and your Secretary. There has been a recent trend toward having reunions on the campus. In view of this, the Committee would appreciate suggestions. Would you prefer a reunion in Boston, with housing at the Institute, or at some outlying rest (?) area, terminating with Alumni Day at the Institute? Send your suggestions to Walter Gale at M.I.T., or to the Secretary.

Word comes from Pittsburgh of the appointment of Milton Male, IV-A, as manager of the building and construction industries section of the U.S. Steel's commercial department. Milton has been with U.S. Steel, in various capacities since 1930. A letter from Salvador Madero, Jr., X, to Brig Allen, throws some light on his past doings—"Although I took Course X, I have been devoted to hydraulic work ever since I graduated and have been in the pump business for the last 19 years. First, I was head of the Hydraulic Department of the Chamber of Agriculture in Torreon, Coahuila, Mexico, testing pumps for efficiency, and then for 10 years with Pomona Pump Company, only to leave in 1947 to accept the position as General Sales Manager with Equipos Mechanicos, S.A., Worthington Pump distributor in Mexico City, and finally accepting a job with the Johnston Pump Company, in Pasadena, Calif., as their district manager for Latin America. With these companies I traveled in nearly every one of the South American countries and found numerous M.I.T. classmates down there. With the industrialization of Mexico, the Johnston Pump Company decided to come to Mexico and build a plant, having got started in April of this year. My position with Johnston Pump Company de Mexico, S.A. de C.V., is vice-president and general manager. If anybody wants to know anything about well-drilling, irrigation programs, or pumping problems in Mexico, will be only too glad to help."

Ed Harrigan, II, was in Boston last summer attending a heating and ventilating engineers' convention. Ed is with Harrigan and Reid, heating contractors in Detroit. Larry Luey sent the following word

on Amasa Smith — "One can't live in Birmingham without regularly reading about Mace in the newspapers and the local state *Alabama* magazine. In 1947, Mace was made manager of the Birmingham plant of Chicago Bridge and Iron Company, for which he has worked since graduation in 1929. Mace is very active in community affairs, and this past year took the biggest association job in the State by accepting the presidency of the Associated Industries of Alabama. All of this, of course, is incidental to his home life with Sarah, their three daughters and a son, and to Mace's experiments with various kinds of grass seed in his yard." Larry has been in Birmingham since 1941, first as comptroller for the Connors Steel Company and presently as assistant treasurer of the Southern Natural Gas Company. Arthur Scott, X, has been appointed Head of the Applied Theory Group, Engineering Research Division, Esso Engineering Department of the Standard Oil Development Company. Arthur has been with Esso Development since 1936. Dr. E. B. Hershberg, X, has been made co-director of scientific research for the Schering Corporation of New Jersey. Emanuel is an expert on Cortisone and sex hormones. Bion Francis, IX, has moved on to Connecticut, heading a centralized insurance department for Olin Industries. Ted Malmstrom, now back in Boston after six years in South Africa, writes of his doings — "In 1946, at the end of World War II, I decided to leave the shelter of the government, where I had been since the depression (1933) and try my luck with private business. So in June, 1946, after six months training by the Coca-Cola Export Corporation, we left by ship for South Africa. . . . Incidentally this voyage was on a 12-passenger freighter and for a rest and nice quiet voyage, it can't be beat. We lived in Johannesburg for our six years in the Union of South Africa and after three years as Division Engineer I became Manager of the Coca-Cola Bottling Company of Johannesburg. The climate in this 6,000 foot high city is grand and the surrounding areas have 18 golf courses. About 500 American families on the 'Rand.' We had one M.I.T. get-together there — about 40 attended as I remember. Desiring to continue the education of our two daughters, aged 15 and 10, in the States, we are back in the States for good and I am currently working for my old firm of Stone and Webster — carried on the payroll as Chief Resident Engineer and due to follow the construction jobs throughout the U.S.A. It's nice to be back and Florence and I were both glad we bumped into you at the M.I.T. Alumni Luncheon on such a beautiful (Mass.) June day. I look forward to our 25th reunion."

Will Barrow, VI, Chief Engineer for Sperry Gyroscope, has been promoted to Vice-president along with his other duties. Al Hayes, X, has been made general superintendent of the Whiting Refinery of Standard Oil Company (Indiana). John Wilson's DoeCam Corporation expects to move into its new modern office and factory on the Charles River in Brighton before summer. Sid Albert, I, writes of a recent trip to Europe without encountering any classmates. His son is a freshman at the Institute. Sid is treasurer of Albert

Pipe Supply Company, Brooklyn, N.Y. I get his circulars regularly but don't use pipe in quantity. One interesting item in his stock is a light-weight portable pipeline system.

Checking through my neglected correspondence I find a letter from Charles Nord, XV, showing him to be quite a prognosticator, or at least an optimist. Letter dated April, 1952, as follows: "You will note from our letterhead that we're getting a bit old down our way. In fact, I sometimes wonder whether or not we should keep on making pearl buttons, since my fellow engineers were not satisfied just to make plastic buttons, — they had to make them at 5 per cent to 10 per cent of the price of pearl. Ouch! We've seen our gross volume dwindle by two-thirds, but dear old inflation keeps me with enough dollars to pay Uncle Sam. . . ." Charlie's company, Nord-Buffum Pearl Button Company, Louisiana, Mo. (seems as though there is a little of everything in Missouri), was celebrating their 50th anniversary. Phil Lamb, XV, has been promoted from vice-president and treasurer to president of the Endura Manufacturing Corporation, Quakertown, Pa. Endura, under Phil's watchful eye, makes latex and glue-glycerine impregnated paper for sheet packing and gaskets, artificial leather, pressure-sensitive tape backings and other industrial products. He reports favorably on business life in Bucks County, and his only daughter. Clipping reports the marriage of Anthony Zahka, XV, to Blanche Marie Elhat of Brooklyn, N.Y., and the promotion of William Higbee to vice-president of Testworth Laboratories, Inc., Chicago, Ill.

Why not shame your Secretary into better performance? — PAUL F. DONAHUE, *Secretary, Conti and Donahue, 239 Commercial Street, Lynn, Mass.*

• 1930 •

George Lawson writes from Montourville, Pa., that he is manager of Sylvania's photoflash plant there and is actively engaged in the establishment of another Sylvania project in Winchester, Ky. The four Lawson children keep Gerrie and George mighty busy. George saw Ollie Green in Washington recently and talked to John Hanley, who was in that city in connection with business for Northern Natural Gas of Omaha.

We are sorry to report the death of four classmates. According to advice from the Alumni Office Everett Felker of Brooks, Maine, passed away in September, 1945, Nandlal Shah of Calcutta in December, 1951, Alexis Berestneff of Syracuse in November, 1952, and Fred Huntington of Bedford, N.Y., in December, 1952. Shah was a professor at the College of Engineering and Technology in Jadhapur. Alex worked with Carrier as chief production engineer. Fred was a coursemate of your Secretary's and was well known in the design and construction of small boats. Our sympathy is extended to the families of these men.

Hugh Skilling of Stanford University has written a book entitled *Exploring Electricity*. Hugh received his master's degree as a member of our Class, as did two other 1930 men who were in the news

recently. Howard Orville, technical consultant for the Friez Instrument Division of Bendix Aircraft, is well known in the field of weather forecasting by radar, and formerly served as head of the Navy's areological service. Alfred Waidelech is vice-president and research manager of the Austin Company of Cleveland. He was recently appointed to the Building Resources Advisory Board of the National Research Council.

Myron Smith has been appointed sales manager of General Radio Company, for whom he has worked since graduation as a development engineer, manager of district offices in New York, Los Angeles, and Chicago, and sales engineering manager. Hermon Scott was one of the speakers at a symposium on amplifiers at a meeting of the Audio Engineering Society in New York City in February. Scotty will welcome suggestions relative to our 25-Year Reunion in 1955 and your three Secretaries will welcome news concerning yourself and classmates. — PARKER H. STARRATT, *Secretary, 1 Bradley Park Drive, Hingham, Mass., Assistant Secretaries: ROBERT M. NELSON, 2446 Iroquois Road, Wilmette, Ill.; ROBERT A. Poisson, 150 East 73d Street, New York 21, N.Y.*

• 1932 •

Spring brings some news from some of the active members of our Class when we were at college. I am beginning to have some correspondence as a result of the class notes, which I appreciate ever so much and hope augurs well for the future.

I had a nice letter from Fred Green, who is living in Weston, Conn. Fred is assistant sales manager, Industrial Equipment, for Nash Engineering Company, makers of pumps and other process equipment. Fred married Suzanne Stevens in 1937 and has four children: Faxon, 11, Bill, 13, Webb, nine, and Edmond, three.

On the other hand, John Kimble, who lives at 6300 Cedar Springs Avenue, Rochester, N.Y., reports he is still a bachelor. Perhaps his work as Technical Representative for Eastman Kodak Company keeps him too well occupied. Jack was a lieutenant in the Navy during the War; he lists himself as a reactionary Republican, but makes no mention as to whether he still plays the trumpet.

I see Bill Kirkpatrick every now and then and can report that he is proceeding under a full head of steam. The job of being Technical Director for Allied Paper Mills would be a full slate for most of us, but Bill seems to find time to run most of the local clubs and societies. He is Honorary Secretary for M.I.T. and devotes considerable time to such fine sports as hunting and fishing. Bill has a fine family. He married Frances Sutherland in 1938 and lives at 2105 Waite Avenue, Kalamazoo, Mich. They have three children: Celia, 12, Ellen, 10, (the best gin rummy player in her age bracket) and Fred, seven, who will probably outdo his father.

Bob Klein is in business for himself, distributing wholesale newspapers and magazines. He married Mary Elizabeth Fisher in 1939 and they have the class average of three children: Judith Ann, 12, George

Robert, 10, and Marilyn Elizabeth, five. Bob was in the Navy during the War and is active in a number of things: Trustee of the Church of the Saviour and St. Luke's Hospital (Cleveland); member of the Cleveland Advertising Club, Kiwanis, Canterbury Country Club, and Cleveland Skating Club, which must indicate a major source of recreation. The Kleins live at 22475 Westchester Road, Shaker Heights 22, Ohio.

We have heard from Abbott Lawrence, all the way from Portland, Ore., where he is pursuing his bent as an architect, being a partner in the firm of Lawrence, Tucker and Wallmann. His practice includes considerable work for the University of Oregon and its Medical and Dental Schools, Research Facilities, Laboratories and similar technical installations. Married, with one daughter, Abbott is a member of the American Institute of Architects, Multnomah Athletic Club, with those fortunate pastimes of fishing for steelhead, coho and trout readily available. He lives at 3940 S. W. Council Crest Drive, Portland 1, Ore.

Our other Lawrence, John, left SKF industries in Philadelphia last July, where he had been vice-president of engineering, manufacturing and research, to go with the Joy Manufacturing Company in Pittsburgh as vice-president of manufacturing. I have seen John recently and know that he is on a very interesting and absorbing assignment with this large manufacturer of mining machinery and allied products. He is living at 46 Ordale Boulevard, Pittsburgh 28, Pa., with another one of our large families: wife, Janet, and five children, ranging from Carol, 12, down to Ann, one. John reports as hobbies: model airplanes and gardening, but I doubt if he has much time for these at the moment.

John Loustaunau seems to have the class record for offspring, with six, ranging from 12 down to two. He supports this busy brood as a Project Engineer for Stone and Webster and lives at 14 Fenwick Road, Winchester, Mass.

Tom Regan continues in the news with his recent election to the Board of Directors of the New England Lumberman's Association. Tom is vice-president of General Box Company and Manager of their New England Division. His headquarters are in Winchendon, Mass. His home mailing address, however, is, Main Street, Ashburnham, Mass., where he lives with his wife, Dorothy M. Graham, and their three children. Tom has kept up with his golf and other sports. — ROBERT B. SEMPLE, *Secretary*, Box 111, Wyandotte, Mich. Assistant Secretaries: WILLIAM H. BARKER, 45 Meredith Drive, Cranston, R. I.; ROLF ELIASSEN, Room 1-153 M.I.T., Cambridge 39, Mass.

• 1933 •

Approximately one month from the day you receive this issue, YOU have a date at the Wentworth-by-the-Sea, Portsmouth, N.H., June 12-14. The occasion is the 20th Reunion of the Class of '33. You doubtless have received details through the mail — if you have not, please contact the undersigned. As this is written the response to our initial mailing has been most gratifying and we look forward to at least 100 fellows at this reunion.

We had a Class of '33 get-together in New York during March which brought out some interesting class information, D. F. Cayce was with us — now with the New York Telephone Company in Sales — and one of his interests is in the mobile telephone service. John Wiley is deputy director of aviation of the Port of New York Authority. For the past year he has been primarily interested in good public relations with the communities surrounding the New York Airports. John is rapidly acquiring the finesse of a good politician. Bob Hegge — still with the American Chicle Company — told us of the development of Clorets and his contact with the "wonder" field of chlorophyl. Ed Goodrich and the Induction Heating Corporation continue to explore new fields for the application of induction heating units. Among their recent projects have been with the can companies for solderless seams, yeastless bread, and so on. Jacques Chepard, Industrial Engineer with the Dictagraph Corporation, Jamaica, L.I., N.Y. tells us of the turmoil caused in the hearing aid business by the change over from vacuum filled tubes to the new transistors.

M. L. "Brash" Brashears, after 16 years with the U. S. Geological Survey, formed a partnership with R. M. Leggette in 1952 as consultants in this field — some interesting applications very close to home. Jack Andrews, Central Manufacturing Department of General Cable Company at Perth Amboy, reported that the demand for heavy cable for public utilities and for magnet type wire was unusually strong because of continued growth in these fields.

Bob Swain, TWA Overseas Operations, dispatching, continues to send planes all over the world and occasionally follows them to all parts of the world checking up on facilities. In addition to his TWA activities, Bob is in the candy wholesale business and also distributes Murray Space Shoes from his home — sounds like Bob Swain Enterprises. George Ropes, Acme Fast Freight and Acme Air Freight, told us of the increased activity in air freight to Caribbean and South American countries — becoming more and more competitive with more usual types of transportation. Leighton Richards, Wright Aeronautical — busily supervising the production of sapphire Jet Engines, which hold great promise when Leighton's production line really gets rolling.

A card from Art Hungerford states that he now is with the Joint Committee on Educational TV working to get educational TV stations on the air — likes it fine — on leave from General Precision for one year. Art was in California during the week of our New York meeting. T. C. Johnson, still with General Electric is now in the Air Conditioning Division at Bloomfield designing Home Cooling Units which are the air conditioning attachments to G. E. warm air furnaces for year-round air conditioners. Carl G. W. Swanson has been ill since November, just recovering during March. We hope by this time he is fully recovered. Mal Mayer reports they have moved laboratories and office of Schwartz Laboratories to Mount Vernon — no more commuting. He is still busy researching for the brewery industry.

Had a note from Ken Clark telling us that he started with General Electric in January, 1952, and now is department safety engineer for the Range and Water Heater Department, which is one of the major appliance divisions, located at the new General Electric Appliance Park at Louisville, Ky. Ken says it is a real operation.

A note from Bill Harper, San Antonio, Texas, tells us he has been actively engaged in his chiropractic practice in San Antonio and he teaches two hours a day at the Texas Chiropractic College. Hopes to make the reunion. George Isserlis, associated with Basic Pigments Sales Company, New Brunswick, N.J., as a stock holder and an officer, says his primary occupation, oddly enough, falls in the textile field in which he is engaged in the manufacture of ladies nightwear and dresses. Ralph E. Cross is now executive vice-president of the Cross Company, Detroit, in charge of Engineering Service, Sales and Advertising — they specialize in machine tools.

Herbert S. Gardner, Jr., has been appointed secretary and treasurer of Gardner Advertising Company. R. D. Fal detta is now with the Facilities Engineering Division at the Lewis Flight Propulsion Laboratory, Cleveland, of the NACA. A note from Dave Nason brings me up to date on his activities over the past 10 years. After leaving Westinghouse in 1947 he joined F. J. Stokes Machine Company in Philadelphia, then New Holland Machine Division of Sperry Corporation, and last summer he left for his present location with Piasecki Helicopter Corporation at Morton, Pa., where he is assistant material manager.

Cal Mohr, one of my best correspondents, tells me that Roland Glepn is to head up a new plant of Carbide and Carbon and that he himself is now happily settled with his bride in Marshall, Ill. Lawrence C. Lebeau has been elected treasurer of the Keene Savings Bank in Keene, N.H.

Remember June 12 — Wentworth-by-the-Sea, Portsmouth, N.H. — it's a date! — GEORGE HENNING, *General Secretary*, Belmont Smelting and Refining Works, Inc., 330 Belmont Avenue, Brooklyn 7, N.Y. ROBERT M. KIMBALL, *Assistant Secretary*, Room 24-105, M.I.T., Cambridge 39, Mass.

• 1937 •

We didn't get any news items from Tech this month, but we did get two nice letters in response to Jerry Salny's campaign. One is from Al Woll as follows: "A brick building doesn't have to fall on me. I can take a hint. So, I'll just sit down at my typewriter and peck out a few lines. In the vernacular of *The Tech*, names make news, so here goes. Milt Lief, XVI, is a far cry from aircraft. Milt is in St. Louis with the American Fixture Company. From latest reports, they now have three children: Anne, Laurence and Debra. When last heard from, Stan (XVI) and Anne Zemansky had their third child, a daughter, Robin, who was born last August. That makes it two boys and a girl. We ourselves were blessed with our third child last August also. It was a daughter, Susan Adele. That makes it two girls and a boy. It was with much regret that I

welched on our 15th Reunion. As luck would have it, I had made reservations to attend. A distress call from my family in Boston necessitated my being there on May 1. My business just wouldn't keep a month while I sojourned in Boston awaiting the 15th Reunion. And two trips east in the same month were out. I hope this explains the lack of my presence there to Fred Claffee and Bob Vogeler with whom I had corresponded and hoped to meet at the Reunion.

"Every Christmas I receive greetings from Bill Healey up in the wilds of New York State. Bill Ingle of our Class I see about every week at the local Rotary Club. Bill is in the domestic black gold (solid) business, as differentiated from mine—the black gold (liquid). Since graduation, from time to time I have written to Windy Johns of my escapades in the business world. However, I believe that I have finally settled down to stay put for awhile. Last year we moved down to Evansville, Ind. Here I designed and contracted to build my own home without the aid of an architect or contractor. I know Anne Zemansky, IV, '39 won't like that. It makes a nice lean-to to keep out the weather. In fact, we even have room for any wayfaring '37-man who gets lost down here on the banks of the Ohio. Evansville makes a good hub for my business which includes farming as well as crude petroleum production. The chemistry and bookkeeping of XV2 has come in good stead for the operation of these businesses. You may recall the song, 'How are you going to keep them down on the farm after they have seen Broadway.' I saw Broadway before I saw the farm, and now that I have seen the farm, I like it. Now, don't complain to me that you are paying too much for your steak. All I received a couple of weeks ago for some cattle was \$.23 per pound. How steaks went to \$1.00 per pound from there is beyond my control."

Bob Thorson wrote me that he "heard from Joe Smedile a while ago. He is still in the Army—a full colonel in the Engineer Corps. Right now he is stationed at the district engineer's office in Jacksonville, Fla. Joe married a Georgia girl and has one boy at present. For myself, I am still trying to roof all the homes in Boston, and right now I am impatiently waiting for the spring weather. By the way, the '37 column in The Review has really picked up, and we all should take our hats off to Jerry Salny for the swell job he is doing."

Bob enclosed a card from Bob Goldsmith with his letter: "Dear Bob: June is approaching and I still find myself in Paris working for U.S.A.F.E. Elsa and I had both looked forward to the Reunion, but nothing short of a miracle could bring us home on time. My best, best regards to you and the other men, tho' I shall be there in spirit for a whopping good time."

This column is certainly much more interesting with personal letters than short clipped news items. Thanks, Jerry.—*WINTHROP A. JOHNS, Secretary, 34 Mali Drive, North Plainfield, N.J.*

• 1938 •

As of March 2, 58 members of the Class have indicated their interest to attend the

class reunion. Some of the fellows in replying to our request for news have told us a little of recent developments.

Howard Milius writes that he joined Humphrey-Wilkinson, Inc., chemical manufacturers at North Haven, Conn., on November 1, 1952, as sales manager. Bill Preece writes: "Announcing arrival of second youngster (second son) on 2-22-53. Family now Bill, Jr., 3½, wife Marie, and John. Dad is supervisor of methods, New Bedford Division, Revere Copper and Brass, Inc."

Fred Ray: "Still with Socony Vacuum but transferred from labs in Paulsboro, N.J., to Refining Engineering Division in New York City, Supervisor of new technical service group."

Jim Emery: "New arrival scheduled June 15. You can understand my quandary." Bob Park: "Now chief engineer, Natural Gas Division of Texas Company's Producing Department. We plan, design, and build Texaco's natural gasoline plants, cycling plants, compressor stations, gas pipelines, and so on. Robert H., Jr., arrived 2-22-52. He's already chopping down the furniture as well as any cherry trees that may be close at hand." Bob's advancement to his present job was also reported in the *Houston Post* on January 4.

T. Y. Shen: "Just got back here (New York) from Formosa. Was working there past two years. Should I be in the States at the time of our 15th reunion, I'll try my best to attend." — ALBERT O. WILSON, *General Secretary*, 24 Bennington Road, Lexington 73, Mass. *Assistant Secretaries*: DAVID E. ACKER, 210 Woburn Street, Lexington, Mass., FREDERICK J. KOLB, JR., 211 Oak Ridge Drive, Rochester 12, N.Y., RICHARD MUETHER, 116 West 67th Terrace, Kansas City, Mo.

• 1940 •

Occasionally your Secretary receives a letter from a classmate from whom he has not heard in a long time. These letters, which are always welcome, help to make it a real pleasure to prepare this column. Such a letter arrived this month from Ray Keyes who is now living in Berkeley, Calif.

"Dear Al: It is about time that I sat down and wrote a letter, so that my brother alumni can know what I am up to these days, and particularly since I am now able to boast of being a married alumnus, and extremely contented with my lot. My wife is a University of Oregon graduate. Information about my recent doings will be found in a copy of the Christmas greeting, which we mailed out to many friends. Some parts of it, you may excise for the class notes. Feel free to quote at will—it is not copyrighted. I would feel very much ashamed of myself to send you this information, fully expecting some of it to show up in the class notes, without paying my dues. Therefore, you will find a suitable check (\$2.50) enclosed. If you can persuade my bank to relinquish the money, it is yours for Class of '40 dues. I really enjoy reading the class notes, and I know it is truly 'a labor of love,' since I write them for the Northern California Alumni Club."

A liberal extract from Ray's Christmas greeting follows: "Dear Friends: This

year it is greetings from the Keyes's—Virginia and Ray. It happened March 8 this year (1952). We are at home at 1706 Jaynes Street, Berkeley 3, Calif. We rent a little house of four rooms with a large combined dining and living room. Virginia is in charge of all decorating features, and Ray does all the repairs and additions. . . . We are happy to look forward to a warm winter, at least inside our house. Ray continues to work as a marine engineer for Tom Lunde, consulting engineer in San Francisco. The office has done mainly troop ship conversion design, but in the latter part of the year it has been engaged in small high-speed boats for the Navy. This has been of new and more challenging interest. Virginia has changed from nursing to home-making and is doing a fine job at it too. She has studied water colors, color and design, and pottery making. Ray is still scoutmaster of troop 30, of Berkeley. We both spent a week camping with the boys at Stirling City on the West Branch of the Feather River, about 180 miles from here. . . . After scout camp we two went on to Oregon via Mt. Lassen, the United State's most recent volcano, where we enjoyed the sights of hot springs, snows, caves, and volcanic devastation. A week with Mother and Dad Norton in Mitchell, Ore., and then we came home. Christmas finds Mother Keyes visiting us. She flew here in October and has found California quite nice. We took her to Oregon and she found that delightful too. We wish we could see you again. If you live near enough, come see us over the holidays. If not, come when you can."

Our Class was honored recently when Sam Goldblith who is an assistant professor in the Department of Food Technology at Tech was selected as one of the 10 outstanding young men in Greater Boston. Congratulations are indeed in order for Sam. Kenny Fox recently joined Fabric Research Laboratories, Inc., of Boston as vice-president and member of the board of directors. Previously Kenny was vice-president of Burlington Mills and prior to that he was president of the Lowell Textile Institute. — ALVIN CUTTAG, *General Secretary*, 7814 Marion Lane, Bethesda 14, Md. MARSHALL D. MCCUEN, *Assistant Secretary*, Oldsmobile Division, General Motors Corporation, Lansing 21, Mich.

• 1941 •

Hank Avery has come through with his second letter in as many months, which should qualify him for some sort of medal; thanks a lot, Hank. His travels have netted the following news: "I visited Howie Samuels recently in Macedon, N.Y. He is running the U.S. Equipment Corporation in partnership with his brother, and it appears very successful. They began operations after the War in a small building, moved into a building many times larger, and now are expanding so rapidly they expect to use the original building again. Howie makes vinyl-coated clothes line, polyethylene refrigerator bags, and a number of other plastics products. . . . Alan Surosky is chief engineer at U.S. Testing Company, which is a very diversified and interesting job. . . . I recently talked on the phone with Dave

Herron. He has been active as Vice-president in charge of engineering for Atlantic Research Corporation, but is presently working with the Atomic Energy Commission in Washington . . . I see or talk with Bill Lifson occasionally. He is a synthetic lubricant expert at this point with the Esso Research Division of Standard Oil Development Corporation. An article by Bill and others on 'Performance of Turbo-Engine Synthetic Oils' appeared in the March 2, 1953, edition of the *Oil and Gas Journal*. . . . At our club meeting last night, I ran into Ed Weinberger, who is with Gulf Research. He is one of the few native Pittsburghers I've met from M.I.T."

Will Mott also wrote, and in his letter, he quoted Sam Fry as follows: "There are quite a large number of M.I.T. Alumni here among Boeing's some 3,500 engineers. Among them you may remember E. Mac Gardiner, VI. As for myself, I worked nearly five years at the Naval Ordnance Laboratory at Washington, D.C., immediately after graduating, on development of underwater ordnance; then a year or so at Bonneville Power Administration in Portland, Ore., doing power system engineering; and the last five years here at Boeing on guided missile development work. The family has grown to eight- and six-year-old girls and a set of two and one-half-year-old twins (boy and girl)." Many thanks to you, too, Will; any and all correspondence is really welcome. I might mention here that shortly after this column appears in print, the deadline for the July issue will be staring me in the face (May 20, to be exact). If any of you are just on the verge of writing, please do it now; otherwise, the stories will lie in the file until time for the November issue, since The Review is not published in summer.

We played some bridge with Millie and Joe Quill during our most recent week end in Schenectady. They have two boys, Steve, six and one-half, and Tim, four; Joe is in the General Electric Industrial Engineering Section as an application engineer specializing in the chemical and petroleum industries field.

An article from the *Boston Globe*, dated January 23, gave this information on one of our Class: "The new chairman of the panel on Procurement of the Armed Forces Regional Council of New England is Edward A. Beaupre, of Nashua, N.H., according to an announcement by Brig. Gen. James F. McManmon, who heads the A.F.R.C. here. Beaupre, a small business specialist at the Boston Ordnance District, has been a member of the procurement panel, which he now heads, for the past two years. He served as an Army officer with the Boston Ordnance District for five years during the war, during which time he had primary responsibility of directing ammunition production. He is a graduate of M.I.T., has staged many industry assistance clinics for industry in New England, and has also been the Army representative assigned to make surveys of critical unemployment areas in New England for the A.F.R.C. . . ." Good work, Ed.

Eugene March has been named chief metallurgist at Crucible Steel Company's Sanderson-Halcomb Works in Syracuse; he has been there six years, and before that he was in the metallurgical labora-

tory and open hearth departments of the Inland Steel Company, Indiana Harbor, Ind. During the war he served with the 2nd Infantry Division and the 7th Army Ordnance Department.

Bob Blake, XVI, took part in a round table discussion on aircraft cockpit simplification and standardization, it was reported in the December issue of *Skyways*. His thumbnail biography, as published in the magazine, says that he joined Pan American Airways as an apprentice engineer after graduation, served in the Navy during the War, and is now staff engineer in the office of the chief engineer. An article by Paul Erlandson on "Telemetering and Direct Frequency Measurement" appeared in *Tele-Tech* for October. Paul is with the Southwest Research Institute in San Antonio.

Quite a pile of address changes has accumulated, as you can see: Warren G. Anderson, 185 Williams Street, Glastonbury, Conn.; Joseph G. Anthony, Euclid-Chardon Road, RD 2, Willoughby, Ohio; Lieutenant Colonel J. Raymond Berry, Jr., 214 Holmes Run Road, Falls Church, Va.; Edward C. Bishop, 146 Temona Drive, Pittsburgh 27, Pa.; Wallace Blanchard, Jr., 22 Seneca Road, Winchester, Mass.; Captain Daniel L. Carroll, Staff CINCNELM, care of Fleet Post Office, New York, N.Y.; Charles B. Cole, RD 2, Wallow, Ore.; James S. Cooney, 36 Tanager Road, Attleboro, Mass.; Dr. Leslie Corsa, Jr., 1069 Webster Street, Needham 92, Mass.; Richard F. Cottrell, 4004 Ortega Boulevard, Jacksonville, Fla.; Arthur L. Covitt, 10 Dellwood, Avenue, Morristown, N.J.; Sherman E. Crites, 5933 Oakwood Avenue, Cincinnati 24, Ohio; Captain Eugene A. Daniels, 641 East 57th Street, Hialeah, Fla.; Robert J. Demartini, Clearview Terrace, Defreestville, N.Y. Malcolm J. Dodd, Main Street, Bethlehem, Conn.; Arthur J. Dore, 510 South Humphrey Avenue, Oak Park, Ill.; John A. Downes, U.S. Bureau of Public Roads, Washington, D.C.; Rogers B. Finch, 27 North Main Street, Broadalbin, N.Y.; John Fonseca, 2724 Front Street, Alhambra, Calif.; Edward C. Forbes, Electro-Metallurgical Company, Box 299, Marietta, Ohio; James H. Fuller, 214-06-29th Avenue, Bayside, L.I., N.Y.; John F. Gilbert, Old Cedar Street, Ashland, Mass.; Floyd W. Iden, Federal Telecommunication Laboratories, 500 Washington Avenue, Nutley, N.J.; David Jacobson, Jr., 937 Delaware Road, Burbank, Calif.; Nels E. Johnson, Jr., 1004 Woodley Place, Falls Church, Va.; Charles B. Jones, 7003 Glen Meadow Lane, Cincinnati 37, Ohio; Walter P. Keith, Jr., 148 Sand Run Road, Akron 13, Ohio; J. Lester Klein, 91 Undine Road, Brighton 35, Mass.; Julius A. Kohn, 2204 Barcelona Road, Schenectady, N.Y.; Major William G. Kussmaul, SACJ 8065 AU, APO 500, care of Postmaster, San Francisco, Calif.; Commander Falkland M. Lansdowne, U.S. Naval War College, Newport, R.I.; Joseph E.M.F. Lecavalier, 2031 Lenester Avenue, Ottawa 3, Ontario, Canada; Professor Irvin E. Liener, C2, 1501 County Road, St. Paul 8, Minn.; Professor John L.C. Lof, University of Connecticut, Storrs, Conn.; Mrs. Burton Lynch (nee Elizabeth E. Marks), 806 Bigelow Street, Peoria, Ill.; Robert D. Mellen, 15 Coronet Crescent,

Bethpage, N.Y.; E. Everett Minett, 430 Morris Avenue, Bryn Mawr, Pa.; Walter E. Morton, Jr., 245 Stratford Road, Des Plaines, Ill.; Edward F. Murphy, Jr., 6437 Swan Avenue, Verona, Pa.; Commander James W. Neighbours, 6638-57th Avenue N.E., Seattle, Wash.; Herbert A. Newey, 730 Los Palos Drive, Lafayette, Calif.; Lieutenant Commander Myron D. Phillips, 621 E. Workman Avenue, Covina, Calif.; William J. Platt, 151 Laurel Street, Atherton, Calif.; Thomas N. Pook, Towers Hotel, 25 Clark Street, Brooklyn 2, N.Y.; Harrie M. Quackenbos, Jr., Union Carbide and Carbon Corporation, Bakelite Division, Bound Brook, N.J.; Arthur W. Robinson, Jr., General Electric Company, Schenectady, N.Y.; Miles Ross, Johns Hopkins Applied Physics Laboratory, Silver Spring, Md.; Albert J. Ruf, 20 Woodland Park Road, Bellport, N.Y.; Ralph G. Schwartz, 9 Terrell Avenue, Hicksville, N.Y.; Charles J. Shannon, W-104-26th Avenue, Spokane 41, Wash.; Lieutenant Colonel Norman I. Shapira, 110 Poplar Street, Watertown 72, Mass.; Commander Henry F. Silsby, Jr., U.S. Fleet Weather Central, Navy 121, care of Fleet Post Office, New York, N.Y.; Robert H. Simon, 109 Sanders Avenue, Scotia, N.Y.; Walter A. Sokolosky, 408 Springfield Street, Wilbraham, Mass.; Dr. Samuel L. Solar, Apt. 34, 4 Duffy Court, Binghamton, N.Y. — IVOR W. COLLINS, JR. *General Secretary*, 28 Sherman Road, Greenwood, Mass. Johan M. Anderson, *Assistant Secretary*, Saddle Hill Farm, Hopkinton, Mass.

• 1942 •

The Executive Committee wishes to thank all those class members who have sent in their \$2.00 class dues. The response so far is good and we are looking forward to an even bigger response so that we may do a bang-up job on the 10th Annual Booklet.

Your Secretary also wishes to record a vote of thanks to Mrs. Michael Lawlor who has recently retired to devote full time to her expected youngster. Pat's (nee Fields) voice is familiar to all of the Reunion Committee members as one of the behind-the-scenes organizers, and it has been her most helpful work which has gone into class correspondence and class agent's letters over the past four and one-half years. I know you all join me in wishing her and Mike the best of everything in the years to come.

Word has reached us that Sherwood H. Willard, Jr., has been promoted to Chief Industrial Engineer of the American Casting Division of the Aluminum Company of America in Buffalo. We have also heard that W. V. A. Clark, Jr., Assistant Professor of Industrial Management at Tech who took his master's degree while we were at the Institute, is an active member of a University-Industry committee studying the problems of "Teaching Materials Handling." Also received a note from Elliot Friedman who, in the course of business correspondence, mentioned that he is with the Specialty Engineering Division of the Specialty Assembly and Packing Company in Brooklyn. Business is apparently quite good so that in spite of the heavy schedule he, Anne and their little daughter Rosalind managed to get off for a week's sun in Miami.

The Alumni Register reports that Paul M. Gross, Jr., has been appointed a professor on the staff of the University of Virginia and has taken up residence in Charlottesville, and that Ken Rosett has completed his tour of duty with the Air Force in Germany and stored his uniform in moth balls. Lieutenant Edward A. Boyd is now stationed at the Naval Air Station, Brunswick, Maine; James M. Beal has taken up with the U. S. Weather Bureau, Washington, D.C.; Ralph M. Buechler has moved to Wausau, Wis.; Dr. Frank C. Canney to Golden, Colo.; Frederick H. Craven to Mishawaka, Ind.; Frank B. Curry, Jr., to Squantum, Mass.; Henry L. Hamilton, Jr., to Floral Park, N.Y.; Dr. Erwin O. Hirsch to Phoenixville, Pa.; Roger F. Morse to San Francisco, Calif.; Wallace S. Murray to East Walpole, Mass.; Albert H. Nagel to Portland, Ore.; Mrs. Phyllis Burghoff Olrry to Mill Valley, Calif.; Philip E. Phaneuf to Anchorage, Ky.; Leon E. Rubin to Brighton, Mass.; Charles E. Ruckstuhl, Jr. to Sherman Oaks, Calif.; Jack L. Schultz to Syracuse, N.Y.; Dr. Robert E. Staff to Valdez, Alaska; Arthur K. Swanson, Landover Hills, Md.; George M. Walters, Jr., to Bangkok, Thailand; R. Ray Weeks to Western Springs, Ill.; Leo E. Wilson to San Antonio, Texas; and Harry M. Zimmerman to Cleveland, Ohio.

Incidentally, Sandy and I are taking off on a junket this summer and will be hitting Paris, Orleans, Geneva, Milan, Venice, Florence, Rome, Haifa, Tel Aviv, Jerusalem, Salzburg, and London. We will be back in the fall with lots of interesting pictures and stories to tell. — Louis ROSENBLUM, Secretary, Polaroid Corporation, 730 Main Street, Cambridge 39, Mass.

• 1943 •

As promised in last month's notes, here are the many items forwarded to me by Dick Childerhose: Hugh Pastoriza, Jr., was in the Army Signal Corps in the Philippines from 1943 to 1946; with RCA Victor division of RCA from 1946 to 1948; then went to Harvard Business School, graduating in 1950; from 1950 to 1952 he was assistant to the Vice-president of Sales, Fairchild Camera and Instrument Corporation; and since September, 1952, Hugh has been with the Special Products Division of IBM (data recording, analogues, to digital converters, and so on). Hugh, who wrote from San Jose, Calif., reports he is still single, and plans to attend the Reunion.

Robert L. Lichten wrote that he moved from Buffalo, N.Y., to Dallas, Texas, when Bell Aircraft established a new helicopter division located between Dallas and Ft. Worth. He is project engineer on their Convertiplane program. He and his wife, Sue, have two boys and expect a third offspring soon. Bob still has hopes to make it to the 10th Reunion.

Bailey Nieder is engineering dept. manager and assistant to the President of Columbia Breweries, Inc., in Tacoma, Wash. Bailey wrote that besides making beer, he has two boys, aged two and one. He doubts an opportunity to make the 10th Reunion, but says he will send a few cases of beer to the reunion affair. Thanks

very much, Bailey! From Middletown, R.I., Prexy Childerhose received word from Morie Seiple, who is married and has two children. His wife, Dorthea, is from Toronto. Morie is head of the Design Branch of the Naval Underwater Ordnance Station at Newport, R.I. He was previously at the Naval Ordnance Laboratory at Silver Spring, Md. He plans to attend the Reunion.

Fred Dickson of Herkimer, N.Y., has been with DuPont for six years, and recently moved to their Engineering Department at the Remington Arms gun plant in Ilion, N.Y. He says it is fine territory for his skiing but not good for a bachelor, which he is. John Goldsmith recently left the beautiful Connecticut valley, where he was with United Aircraft Research, for the West Coast. He is now with Northrup Aircraft, and likes it very much, including the week's vacation at Christmas, he says. He lives in Palos, Verdes Estates, Calif. Albert J. Kelly of Westfield, N.J., reports a wife and three children in his brief note.

John Lipford, of Greensboro, N.C., says that he plans to attend the 10th Reunion. He was first with General Motors in Linden, N.J., then in the Navy; next, he was chief engineer of Virginia Metal Products Company, and is now vice-president of Modern Metal Products Company, making display equipment, and so on. Sid Atlas of Houston, Texas, started the Atlas Air Conditioning Company in 1946 after his stretch in the Navy. He has a wife, Helene Allen, a University of Texas graduate, two children, a dog, and a partner. He specializes in residential air conditioning and has installed more of this type than any other contractor in the country.

Our class Prexy also sent in these items for the notes: Ernest W. Upton of Lake Orion, Michigan, wrote that he enjoys contact with the class through The Review and the Newsletters. You may remember, Ernest came to Tech after graduating from the University of Denver, and was in Course II-A. He is a member of the Transmission Development Group at General Motors. In June he will be married to Miss Connie Nelson, a buyer with the J. L. Hudson Company of Detroit. This, he says, will prevent his coming to The Reunion, but he would be glad to have any of the Class look him up while in or around Detroit. Peter Wiesenthal's wife, Bonnie, wrote that she and Pete are planning to come to the Reunion. She is the former Ruth Emily Scott of Yonkers, N.Y., and they were married on June 28, 1952, in New York.

Gray Trembley, who was a grad student with our Class, wrote to S.R.C. as follows: "I probably have never sent in news before to anyone, partly because I am a modest fellow . . . (not so, we welcome it. — Ed.). I have been working since 1948 for Browning Laboratories in Winchester, Mass. They make tuners, 'scopes, and test equipment . . .

"Last June 14, I married the former Miss Emma Jane West, of Hancock, N.H., and we moved to Arlington, Mass. We are active in church and Scout work and do not have much free time beyond these two activities and our regular jobs."

As mentioned before, all of the above notes were sent to Dick Childerhose, who

forwarded them to me. With the last batch Dick sent this short note: "Slight delay caused by arrival of number four daughter, early morning of March 5. Connie and baby are doing fine, but that, plus usual number of things connected with work, business trips, and so on, have had me on the run." Congratulations, Dick and Connie; four daughters may be a class record!

From the Portland, Maine, Sunday *Telegram*, we have the following news item about a classmate who received his doctor's degree with our Class: "Stewart G. Fletcher, chief metallurgist with Latrobe Steel Company, will address the Portland Chapter of the A.S.T.E. Modern Developments in tool and die steels will be discussed by Dr. Fletcher, who, in 1945 and 1949, was awarded the Henry Marion Howe Medal by the American Society of Metals for the best technical papers of the preceding years. . . ."

A news item from *World Petroleum* magazine in January tells of another doctor's degree recipient of our Class: "Charles R. Hetherington, formerly of Ford, Bacon and Davis, Inc., engineers of New York, has been appointed vice-president of Westcoast Transmission Company Ltd., of Calgary, according to an announcement by Westcoast president Frank McMahon.

"Mr. Hetherington has been associated with Westcoast for more than three years, and collected the technical evidence on the natural gas pipeline which Westcoast plans to build. . . . A graduate of Oklahoma University in chemical engineering and of M.I.T. with the degree of Sc.D. he has spent nearly all his business career in the petroleum and natural gas industry."

Getting back to the undergraduate level of the Class, here's a letter I received from Bill Wilson, Course I, from Spokane, Wash.: "I am not writing as secretary of the local M.I.T. Alumni Association, a rather dubious office which I was maneuvered into by my cohorts at a meeting which I did not attend some months ago. Rather, I just wish to answer your card, say hello to you, and ask you to extend my good wishes and greetings to any of the Course I, '43 boys who may have the good fortune to attend the forthcoming reunion.

"If my memory serves me well (which is begging the question), were you not at the summer C. E. Camp in Maine in '41 along with Bill Avent '42, Vic Darnell, Gene Eisenberg, Jim Libby, myself, and so on? So much proverbial water has flown under since then that my recollections are hazy at best. (I sure was there at Camp Technology, Bill; it was a summer I'll never forget — Ed.)

"I have had my own office just a year now, having managed an office here for a Portland firm from '49 to '51, then practicing as a partner in another firm from '51 to '52. Prior to '49 I worked in Los Angeles and Portland. I haven't seen Jim Libby since '45, in California, and haven't heard from any of my Civil Engineering classmates for years.

"Please do extend my warmest greetings to any of the fellows whom I knew at M.I.T. from '41 to '43." Classmates may remember that Bill transferred to Tech

from Reed College in Portland, Ore., on their five year co-op program with M.I.T. Bill's consulting practice is known as William W. Wilson, Architectural and Consulting Engineer.

From his consulting engineering offices in New York City, I received the following fine letter from Sam Scharff, VI: "You catch me at an opportune moment for writing — assuming that you really meant it when you asked for mail.

"I've just finished a tour with the Air Force, having been called up in mid '51 in one of the grabs into the reserves. This, as is usual in such cases, upset my existence considerably (Dick C. didn't have me in mind when he noted a trend toward a less hectic existence for most of us!); but I was extremely fortunate in a number of ways. I drew a very interesting assignment, in the Plans Office of the Rome Air Development Center (Rome, N.Y., that is), on large-scale weapon control systems. The study of the desirable relative degrees of automaticity in such systems I think is interesting in itself, and also for its implications with respect to the development of automatic processing equipments and facilities. A number of capable and interesting people were involved. In part the proceedings were enlivened by the spectacle of M.I.T.'s Lincoln Laboratory deporting itself, which gave me the opportunity of viewing an M.I.T. agency from a non-M.I.T. point of view. Also, we had to bail out of a C-45 up near Rome one night last summer; every one got down unhurt, but this I consider to have been perhaps a little *too* interesting. I was prevented by a Congressional ban on promotions within the Air Force from attaining the high rank which not my own talents but my position as a member of the illustrious Class of 1943 naturally entitles me; but the General got a Commendation Medal for me, of which, I was a little surprised to discover, I am proud.

"Now that my time's my own I'm indulging my taste for work on large-scale control systems and at the same time looking into small-scale computer-control projects. This goes on from an office in New York City — visitors welcome! — under my own name, which still gives me an odd sensation after all these years working with rather closely-knit organizations. Did it strike you that way?

"I have seen Alan Milman and Jim McDonough from time to time; and I met Hugh Pastoriza's brother, Jim, in the course of some of the work at Rome. All appear to be in excellent spirits and congenial circumstances — and I heard a rumor that Warren Schwarzmann is married. I think modesty is a bar to such things as this. Please edit judiciously!" (No editing required, Sam, for your interesting letter. — Ed.)

Bearing the letterhead of American Brake Shoe Company, Engineered Castings Division, Rochester, N.Y., came this letter from Greg Azarian: "I was married to a very nice school teacher from New York State on June 25, 1950. We have been living here in Rochester all that time since I have been a sales engineer for the American Brake Shoe Company, with a small territory — Northeast United States. We had our first child, a little girl named Madeline, on December 15, 1952, and

just prior to the birth of the baby bought a 27-acre farm outside of Rochester. So, at the present time I am residing as a country gentleman whenever I am home, and enjoy life greatly as I always have. Occasionally, about once every two months, I get back into the Hartford territory.

"Loring 'Hap' Hosley, whom I am certain you remember, works as sales engineer for the Lamson Corporation, working out of Trenton, N.J. He also plans to attend the reunion with me."

Greg asked some questions in his letter about the reunion, which I'll answer here for the benefit of all. The reunion at the Mayflower Hotel, in Plymouth, Mass., starts officially at 6:00 P.M. on Friday, June 12, with dinner, and ends Sunday afternoon, June 14, at 3:00 P.M., after Sunday dinner. We will be there on the American plan, which means that your reservation will cover your rooms and meals. The M.I.T. reunion is on Monday, June 15, with luncheon in the Great Court, and the Stein on the Table Banquet in the evening. You may wish to make reservations for Boston hotel accommodations for Sunday night, if you plan to attend the Monday affairs.

Chairman Jim Hoey, Jr., reports that as of the middle of March, 55 couples and 40 stags, for a total of 150 people, are definitely coming to our 10th Reunion, and about 150 more people have indicated that they may be able to make it. This terrific response will probably break all M.I.T. records for reunion attendance, but breaking records is nothing new for our Class.

But remember, all reservations must be mailed to the Reunion Committee not later than one week after you read these notes. If, by chance, you didn't get a mailing, and plan to attend, write to Jim Hoey, 1826 Centre Street, West Roxbury 32, Mass. Also, it's never too late for class dues, especially just before the reunion, so let your conscience be your guide. Thanks again, fellows, for your many fine letters. — RICHARD M. FEINGOLD, Acting Secretary, 49 Pearl Street, Hartford 3, Conn.

• 1948 •

We are pleased to be able to say that there has been an excellent response to the pleas for a good turnout at our reunion scheduled for June. As Ron Kallman mentioned in his flyer on the reunion, a good portion of the Class living around Boston have been given committee assignments and so they are all attending, and in addition we have heard from a number of others who also will be there. (These notes are written for a March 20 deadline, so the returns from our general mailing on the reunion are not yet available.)

First, to let you know who is on the committee which is planning this rip-snorting event, here's a list: Ron Kallman, Vice-chairman and Publicity; William Zimmerman, ex-officio, (This means, in Latin, by virtue of his office, as Class Secretary. I had to check that in Roget's.); Joe Yance, Treasurer, (unbonded); Bob Mott, Registration and Reception, (Bob is at Phillips Andover and we thought that he had the best sounding address to have mail sent to); Russ Stevens, Sports and

Program Co-ordination; John D. C. Little, Banquet, (John's experience with Voo Doo smokers and other gala events should be a help on this job); Jim Adelstein, Transportation, (After Jim got this job, we found he doesn't own a car); Bill Katz, Music, Poker, and so on, (Bill's superb work on the Tech Show means we're in for some more good melody); Frank McGowan, Bar, Souvenirs, and Prizes, (Everybody knows why Frank took this job); Stue Thayer, Photography and Sound Recording, (Behave yourself or Stue will show you what you did when we have our 10th in 1958); Warren Wells, Sunday Luncheon and Lost and Found; Ben Brettler, Nominating Committee; Norb Andres, Secretary; and Dave Higginbotham, Graduate Students.

Some of the non-committee members we have heard from who say they are coming include Dave Cist, our wonderful President, Bob Wofsey, with the perpetual smile, Em Callahan, the '48 frogman, Ken Brock, who has now had five years in advertising and selling to collect stories he plans to tell us, Jerry Krinsky, who changed his affiliation from '49 to '48 in order to be with all those wonderful guys in our Class, and many others, we hope.

Just in case our flyer did not reach you, or if you've misplaced it and haven't yet made up your mind about attending, here's a rundown on the program. The event is scheduled for June 13 and 14 when the almanac promises sunshine and warmth. We start on Saturday morning and run through Sunday afternoon. Our location is the Mayflower Hotel at Plymouth, Mass., and our hotel costs will be around \$15.00 per person. In addition there is a head tax to cover beer, banquet, and so on of \$8.00. The events are all very informal, planned to give you a maximum of time for renewing old friendships. We plan to have a challenge softball match with the Class of '43 which is also having its reunion at the Mayflower. If you want more information, write to Bob Mott, Andover Cottage, Phillips Academy, Andover, Mass., and he will send you the second mailing of information, which goes only to those who ask for it.

Enough of the reunion for now. Let's have a tremendous showing when the day arrives. We'll even get a second South Shore hotel if we get enough participants!

Our regular news is not large in volume this month, but the individual items are all important. For instance, Stephen Miller married Georgette DeLisle, in Leominster, with John Twomey holding forth as best man. Bob Du Bois became engaged to Constance Bristol of Philadelphia on January 3. She is a Bryn Mawr girl. Angelo Giambusso of Everett received the Bronze Star for meritorious service in Korea. Bob Stern has joined the Staff of A. D. Little, Inc. Roger Sisson writes from California that he's working as Director of Customer Engineering at the Computer Research Corporation. He'll be travelling a lot with the new job, so keep your eyes open for him.

How about everybody writing in a short note to let us know where you are and what you are doing. Roger Sisson did it and so can you. — WILLIAM R. ZIMMERMAN, General Secretary, 1604 Belmar

Road, Cleveland Heights 18, Ohio. RICHARD H. HARRIS, Assistant Secretary, 26 South Street, Grafton, Mass.

• 1951 •

It is with deep regret that your Secretary announces the news of the tragic death of Tom Bishop. Shortly after graduation Tom entered active duty with the Air Force and commenced training to be a "jet" plane flyer. On March 9 Tom was killed in a jet bomber crash at Indian Springs, Calif. While at Tech, Tom received his degree in Civil Engineering. In addition, he found time to engage in many activities and to make many staunch friends, in his Course as well as in others.

Bob Benson surprised your Secretary by a welcome note giving us some news of his activities. Bob reports that the Army assigned him duty at the Evans Signal Laboratory at Fort Monmouth, N.J. Dick Lock is stationed at the same place so they have ample time when off duty to hash over old times; Dick and Bob had been roommates for a few years at Tech. Bob also dropped a gentle hint for your Secretary by saying marriage is one of the finest institutions. Other service news: George Benson is now stationed at the Edgewood Proving Grounds in Maryland; I believe there are several other Course X boys there. Don L. Brown, who is now on active duty with the Army in Austria, received his silver bars recently. Lieutenant Fred Bumpus recently spent a 15-day leave in Switzerland and Italy. Fred was sent overseas in April of 1952. During his tour of duty, he graduated from ordnance school at Eschwege and from intelligence and education school near Munich. Since Fred entered the service in August of 1951, I'm sure that the month of August of 1953 will be an eventful one for him. And I'll bet other '51 men, who entered the service at that time, are eyeing civilian clothes already.

Dale Cooper has joined the large contingent of Tech men at Wright-Patterson Air Force Base. Bill Deale is now a midshipman at Annapolis. The 18th Weather Squadron A.P.O., New York City, is now the address of Dick Frost. Ensign Joe Hodnick is enjoying sunny California (apologies to Florida fans) with a duty assignment with the Naval District Public Works Office at San Diego. Dave Kallander, who is currently a project officer with the Rome Air Development Center, Griffiss AFB, Rome, N.Y., recently received a promotion to first lieutenant.

Another candidate for the M.I.T. Club of Wright-Patterson: Allan Larsen has recently been assigned duty at that field. John Nevins is now with the Army in the Pacific areas. Gordon Rampy is now working for the Army at Ft. Meyer, Arlington, Va. Bob Schiesser received his silver bars recently; Bob will probably complete his tour of duty in his present job as instructor at the Provisional Restone Ordnance School in Alabama. Commander Lowell Shallenberg has been transferred to the Naval Engineering Experimental Station at Annapolis. The Naval Air Turbine Test Station at Trenton, N.J., is utilizing the services of Ensign Denny Spangler.

Lou Stern is getting a chance to use his engineering background at Camp Winfield Scott, Calif. Herb Voelcker, who is

working for his M.S. at Tech, continues to win more honors in rifle marksmanship. Recently he received an Army certificate of achievement in that specialty. Fred Lehmann visited 'Ye Olde Bean Town' recently and surprised your Secretary when he dropped in at the "B" School. Of course, we engaged in a bit of dignified gossiping by exchanging notes about the '51 men we came across or heard from. Sandy Sussman wins the coveted distinction of being the first '51 man completing required military service; Sandy is now working for CBS Television in New York City. Dick Moroni is now flying jets somewhere in Korea.

Now let's take a look at what the marital crystal ball has to tell us. Engagements: Lieutenant Chuck Gern to Barbara Wollaeger of Milwaukee, Wis.; Carl Hill to Jean Shirley of Pittsburgh, Pa.; Ed Lays to Evelyn James of Rochester, N.Y.; Curt Snow to Kathryn Nicklas of Old Westbury, N.Y.; Curt recently returned from Tripoli in North Africa, where he was doing civil engineering work; Henry Cobb to Joan Spaulding of New York City; and George Downie to Joan Voorman of Ridgewood, N.J. Marriages: Bob Haberstroh took Ann Steiger as his wife in December at Livingston, N.J.; Bob is teaching and working for his doctorate at Carnegie Institute of Technology. John O'Donnell, who is currently a member of the teaching staff at M.I.T. while working for his doctorate, and Mary Feeney said "I do" in January at Manhasset, Long Island. Jim Ricketts and Nancy Kent walked the marital path in January at Shaker Heights, Ohio. Gerald Robinson and Marilyn Reese became Mr. and Mrs. in January at Manhasset, Long Island; Gerry is working for Hazeltine Electric Company at Long Island. Bob Shaffer and Joan Gray took their marital vows in January in Wilmington, Del. And now for further news of the other diverse activities of the guys and gals of '51.

The Lewis Flight Propulsion Laboratory, Cleveland, Ohio, is making excellent use of the technical talents of many M.I.T. men; John Bailey, representing '51, is in the Materials and Thermodynamics Division. John Beasley, since 1951 a chemist in the research division of the DuPont Company's Polychemicals Department at the Experimental Station at Wilmington, Del., has been promoted to research supervisor. In his new assignment John will direct studies to determine how molecular structure affects the behavior of ethylene polymers. Hugh Faville is doing city planning work for the city of Manitowoc in Wisconsin. Arturo Jofre has changed his residence: from Coral Gables, Fla., to Rancagua Sewell, Chile — I guess Horace Greeley's advice can be changed to: "Go South, young man!" Arturo is connected with the Braden Copper Company.

Among the '51 men employed by United Aircraft's Standard Hamilton Division are: Gerry Ikelheimer, John McCathy, Orlo Powell, Fred Scheidler, and Roger Weatherbee. And now a note about one of our coeds; Marge Irby (now Mrs. Koenig) has gone to Europe to set up house for her husband, Dick '50, who has been given European duty by the Army.

Olaf Remmler is working for the Radio Division of the National Bureau of Stand-

ards at Boulder, Colo. John Ross is associated with the Department of Chemistry at Yale University, one of our friendly competitors. Lou Sylvia has been appointed division engineer in charge of the construction of two laboratories and an experimental pilot plant at Gibbstown, N.J., for the DuPont Company. Lou has been employed by the DuPont Company in the construction of a new dacron plant at Gibbstown since his graduation in '51. Tonie Terrenzio is still receiving his Review via the Creole Petroleum Corporation at Caracas, Venezuela. George Field is at the Graduate College of Princeton University. Bajirao Gokhale is working in the Physics Department of the Indian Institute of Technology at Kharagpur, India. Ed Mason is doing some research work for the Navy at the University of Wisconsin. Rai Okamoto is continuing his city planning studies at Yale University's Graduate School of City Planning. Arnold Rothstein, Course XV, became a professor at the School of Economics and Business of the State College of Washington.

Roger Christman helped alleviate your Secretary's frantic pleas for news by sending a letter. Roger writes: "After leaving Tech, I checked in at Houston to work for the Shell Oil Company, as an engineer in production. After a year of training in New Mexico, Texas, and Louisiana, doing roustabouting, roughnecks, oil well-pumping, warehouse work, and engineering of various sorts, I was dumped here midway between Baton Rouge and New Orleans.

"My work consists of corrosion alleviation, water treating, design of casing and tubing strings for oil and gas wells, securing of surface leases, and related work, including an abundance of paper work. Since the basic unit of oil production is the well in the field, such equipment as flow lines, tank batteries, and pipelines merit prime attention, and I get a healthful combination of indoor and outdoor work." Roger also added that he married Mary Beckett of Calais, Maine, last April, 1952.

Well, gang, it's time to close shop and begin my spring vacation with studies and job hunting on the agenda. I hope some of you single men (I believe there are a few of us around) will throw off the "spring fever" blues and shock me with copious data about '51. — STANLEY J. MARCEWICZ, Secretary, Gallatin D-25, Harvard Business School, Boston 63, Mass.

• 1952 •

Now that May's here, the time has come for us to get our golf clubs and tennis rackets into shape; it's time to break out the swim trunks from the mothballs, hoping that the mothballs were kinder to your swim suit than they seemed to have been to your girl's. Oh, well, you never had it so good.

Newspaper Notes: The Portland, Oregon, *Oregonian* announced the engagement of Janet Easterday to Howard Tupper, of Berkeley, Calif., on December 29. Howard is at present a chemical engineer with Standard Oil of California. The wedding is planned for this spring in Palo Alto, Calif.

The New York *Herald Tribune* announced the engagement of Una Wilson

of Katonah, N.Y., to Stanley Law, of St. Paul, Minn., on January 10. A summer wedding is planned. At present Stan is with the Aluminum Company of America.

The Wakefield, Mass., *Item* featured the wedding of Carol Rodgers, of Wakefield, Mass., and Donald Jaffe of East Hampton, Conn. The United States has plans for Don following this June; he will go on active duty as a second lieutenant in the Army Ordnance Corps.

The Springfield, Mass., *News* headlined the international romance and wedding of Gloria Goyeneche, a Bogota, Colombia, miss, or I should say, señorita, and Dick Vyce of Springfield, Mass.

Company News Notes: Hamilton Standard Division of United Aircraft Corporation announced the following '52 men in its Engineering Department: Jerome Pickett and John Warner.

Signal Corps Training Center, Camp Gordon, Ga., published the following information through its Public Information Officer: Lieutenant Ed Gulachenski has been assigned to the 844th Signal Radio Relay Company on post.

Droppings From The Mail Bag: Al Olsen writes: "I'm serving in the Army Corps of Engineers since August and am now ready to head overseas. Spent three months at Ft. Belvoir going to school and then three at Ft. Leonard Wood, Mo., teaching mechanics of instruction to O.C.S. candidates and others. Got married on January 5 to Ruth Eatough of Ephraim, Wis., and leave next week for the West Coast and on across the Pacific."

Stan Sydney writes: "Stan Sydney is at M.I.T. filling up space and not much more. I haven't worked less and felt worse for it, since I came here. But seriously, the work is interesting and except for a little slump attributable to my inability to do well with a Wellesley gal, I'm doing fairly well."

John Small was in town recently on his way to the Far East. Ralph Vitti is also going there. Ralph recently married a Cambridge girl; I don't recall her name.

Werner Kahn is having troubles with the females in Rio. It seems that he was late for a date one evening and rented what had at one time been a taxicab. After spending \$10.00 he finally reached his girl's house, only to have her send him away curtly with a note thrown from her window.

I see Bob Briber now and then. Nick Melissas is working with the D.I.C. Donn Combellec is doing graduate work in Physics; likewise Manny Rotenberg. Tony Ralston, Tom Stern, Steve Sussman, Phyllis Fox, Bob Bacastow, Manny Libermann, Nick Haritatos, and others are still

here at Tech. Ed Lawlor and I are working in the Civil Engineering Department along with Hal Lawrence.

Harold Roth writes: "Vic Mizel and Phylis Schulman of Washington, D.C., became engaged last New Year's Eve. Phil Gibber is taking his pre-flight training at Pensacola, Fla., with the U.S. Navy. He joined the fencing team down there and was on tour for a while fencing the major college teams. Last year, if you remember, he was captain of the M.I.T. fencing team. George Swartz is at the University of Pennsylvania Graduate School studying for a master's degree. He'll go into the Army this June. As for me, I'm at the University of Pennsylvania, also working for my master's degree.

Mike and Lee Green write: "We thought you might be interested to know we tied the knot, the we being Leba Cohen and Michael Green. The date of our marriage was June 26, 1952. We have been living in Philadelphia, Pa., for the past few months. Mike is working as a metallurgical engineer for the Franklin Smelting and Refining Company."

Arnie A. Kramer writes: "Less than two weeks after graduation, I had already reported for active duty at Fort Dix, N.J. After an uneventful two months as Assistant Commissary Officer, I was sent to the QM School at Fort Lee, Va. While down there I ran across Lieutenants Copenhefer, Ellis, Geisler, Scalmandre, Zavalakes, Weber, Zartarian, Steinberg, and Olney. On a few weekends in Washington, D.C., I ran across more Second Lieutenants — Ayers and Lycan from Belvoir, Lux from Baltimore, and Weiss from Aberdeen. After graduating from school at Lee in the latter part of November, I was sent back to Ft. Dix, this time as Assistant Clothing Sales Store Officer. I then became QM Shops and Classification Officer.

"During this time, I acted as an usher at the wedding of Lieutenant Gil Steinberg and Rita Haber on December 28 in Cedarhurst, Long Island. A few weeks later I received my orders. I'm to be in Seattle on April 10. Incidentally, Gil Steinberg also received his orders for the same place — only one week later.

"At present I'm at home in Worcester taking it easy. I just heard that Lieutenant Dave Weiss got engaged to Connie Biller from Radcliffe. Every few days I run into Boston and stop over with Mike Goldman and Larry Golden, who are working for their master's degrees. They're not escaping from Uncle Sam's clutches, however, as they both have orders following graduation in June." (Incidentally, Arnie, "Molly" is completely new to me.)

Taj Hanna writes: "I'm going to be

married on June 27. At present, all I do is sit at a desk, write letters, sign papers, listen to sob stories, punch TS cards, and starve to death in abject silence. As you have probably guessed by now, I'm what they call squadron adjutant."

Odds and Ends: In recent trips to Boston and Baltimore the following hot news about '52 men has come this way. Lenny Polaner and Ed Schwartz enjoying themselves at Harvard Business School; "Cieko" Neunhoffer also there. Jerry Meislin trying for his Doctorate at Harvard School of Economics; Bill Vogt at Harvard Law School; Bob Briber and Dick Lacey struggling to get their degrees from M.I.T. Graduate School before the Army gets them; Larry Garthe working with Project Lincoln; Joe Miller and Bill Rusch working for their VI-A degrees. Dana Ferguson now with the Draper Corporation in Hopedale, Mass. Don West and Dick Quigley working on their fifth years in Aero. Milt Dietz, George Friedensohn, John Dieckmann also still struggling with Tech. Jim Davidson up from Birmingham, Ala., to visit Wellesley and Tech. Leon Polinski, we hear, is at nearby Worcester Polytechnic Institute Grad School.

I saw quite a few '52 men at Aberdeen Proving Ground, when I dropped in for Sunday chow. John Mattson is now stationed there with a Human Relations research group; Ed Neumann in the G-3's office at the Ordnance School (Plans, Training, and Operations). Art Martin now waiting to go to Army Pilot School in Texas and thence to Fort Sill, Okla. Dan Sullivan, a recent proud graduate of basic training at the Ordnance Replacement Training Center, is now teaching at the Ordnance School.

Around New York City: George Zavalakes, has just recently joined Jack Copenhefer and Gerry Ellis in Jersey City, N.J., where they are attending the Quartermaster Petroleum School. Lou Karvelas is serving as Chief of the Management Branch of the Comptroller's Office at the New York Chemical Procurement District; Lou is also doing review and analysis work and is attempting to establish work units for the various jobs in the procurement office.

Yours truly is also with the New York Chemical Procurement District, serving with the Procurement Division. My job consists of making contracts, expediting deliveries, and keeping control records for the purchase of chemicals. Well, enough editorializing for the month. It's time to sign off until next month. — STANLEY I. BUCHIN, Secretary, 150 Tryon Avenue, Englewood, N.J.

REMEMBER M.I.T. ALUMNI DAY

MONDAY, JUNE 15, 1953



"OPERATION EARTHOVING" — another tough job

that demands **AMERICAN BOSCH** performance

Dams, airports, super-highways . . . when contractors set out to move dirt, they really give Mother Earth a face lifting. And when projects involve millions of cubic yards of earth, giant trucks and earthmovers shoulder heavy loads . . . help meet tight schedules.

American Bosch products contribute to the dependable, economical, efficient performance of both Diesel and gasoline powered equipment. On Diesels, American Bosch supplies one of the most vital elements for reliable operation—the fuel injection system. And American Bosch electrical equipment—

heavy duty generators, voltage regulators and magneto—has long been a symbol of dependability in construction, as well as many other fields.

Today's American Bosch fuel injection equipment is the result of nearly two million man-hours of research and engineering. Combined with rigid standards of precision manufacture and skilled service, such thorough developmental work indicates why American Bosch products are held in such high regard in the automotive, aviation and Diesel fields. American Bosch Corporation, Springfield 7, Massachusetts.

AMERICAN BOSCH



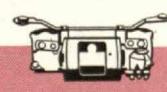
Automotive and
Aviation Magnetos



Generators and
Regulators



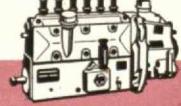
Components for
Aircraft Engines



All Electric
Windshield Wipers



Ignition
Coils



Diesel Fuel
Injection Equipment

Announcing NEW Variacs



for Increased Performance
and Even Longer Life

with Duratrak Construction

The new DURATRAK brush-track construction is the most important improvement in the variable autotransformer since its original development by General Radio Company in 1933.



Variacs with Duratrak have these Important Advantages—

- ★ Longer Life — essentially that of any fixed-ratio power transformer
- ★ High Initial Surge Currents — all VARIACS with DURATRAK will withstand initial surges ten times their rated current
- ★ Overloads — safe allowable overload is considerably in excess of that possible with old-style VARIACS
- ★ Less Maintenance — under normal conditions maintenance of these new VARIACS is negligible — the new DURATRAK is subjected to no deterioration when VARIACS are operated within their rated load

The new Duratrak type of construction is found exclusively in VARIACS. These units set a new standard in reliability, greatly improved performance, long life and minimum of maintenance.

Fill in Coupon Below for Your Copy of the NEW VARIAC BULLETIN

Variac®

the Original
Continuously-Adjustable
Autotransformer

GENERAL RADIO Company, 275 Massachusetts Avenue, Cambridge 39, Mass.

Send me a copy of the NEW Variac Bulletin which describes the new Variacs with Duratrak.

Name.....(566)

Company.....

Street.....